Historic, archived document

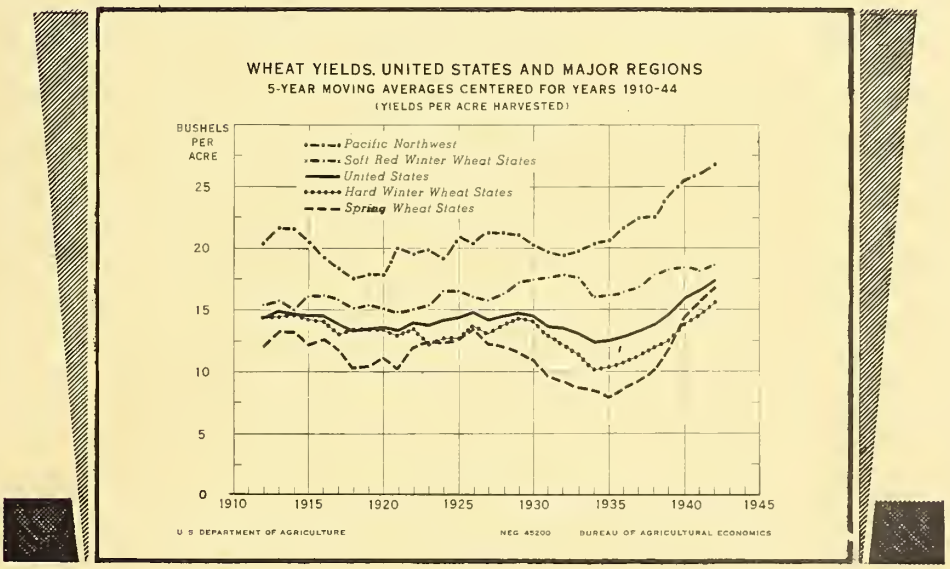
Do not assume content reflects current scientific knowledge, policies, or practices.

F.M. 48

U. S. DEPARTMENT OF AGRICULTURE
BUREAU OF AGRICULTURAL ECONOMICS

1941
A6F22

WHEAT PRODUCTION IN WAR AND PEACE



by

Carl P. Heisig, Ernest R. Ahrendes, and
Della E. Merrick

LIBRARY
CURRENT SERIAL RECORD
☆ JUL 7 1945 ☆
U. S. DEPARTMENT OF AGRICULTURE

WASHINGTON, D. C.

MAY 1945

ACKNOWLEDGMENTS

This report relies heavily upon statistical data developed in the Bureau of Agricultural Economics. Information on varieties of wheat and diseases of wheat was supplied by the Bureau of Plant Industry and Soils and Agricultural Engineering of the Agricultural Research Administration. John S. Cole and S. C. Salmon of that Bureau reviewed the report and made suggestions as did Virgil D. Gilman of the Extension Service. Suggestions were also made by Sherman E. Johnson and co-workers in the Bureau of Agricultural Economics.

WHEAT PRODUCTION IN WAR AND PEACE

By Carl P. Heisig, Ernest R. Ahrendes, and
Della E. Merrick, Agricultural Economists

Contents

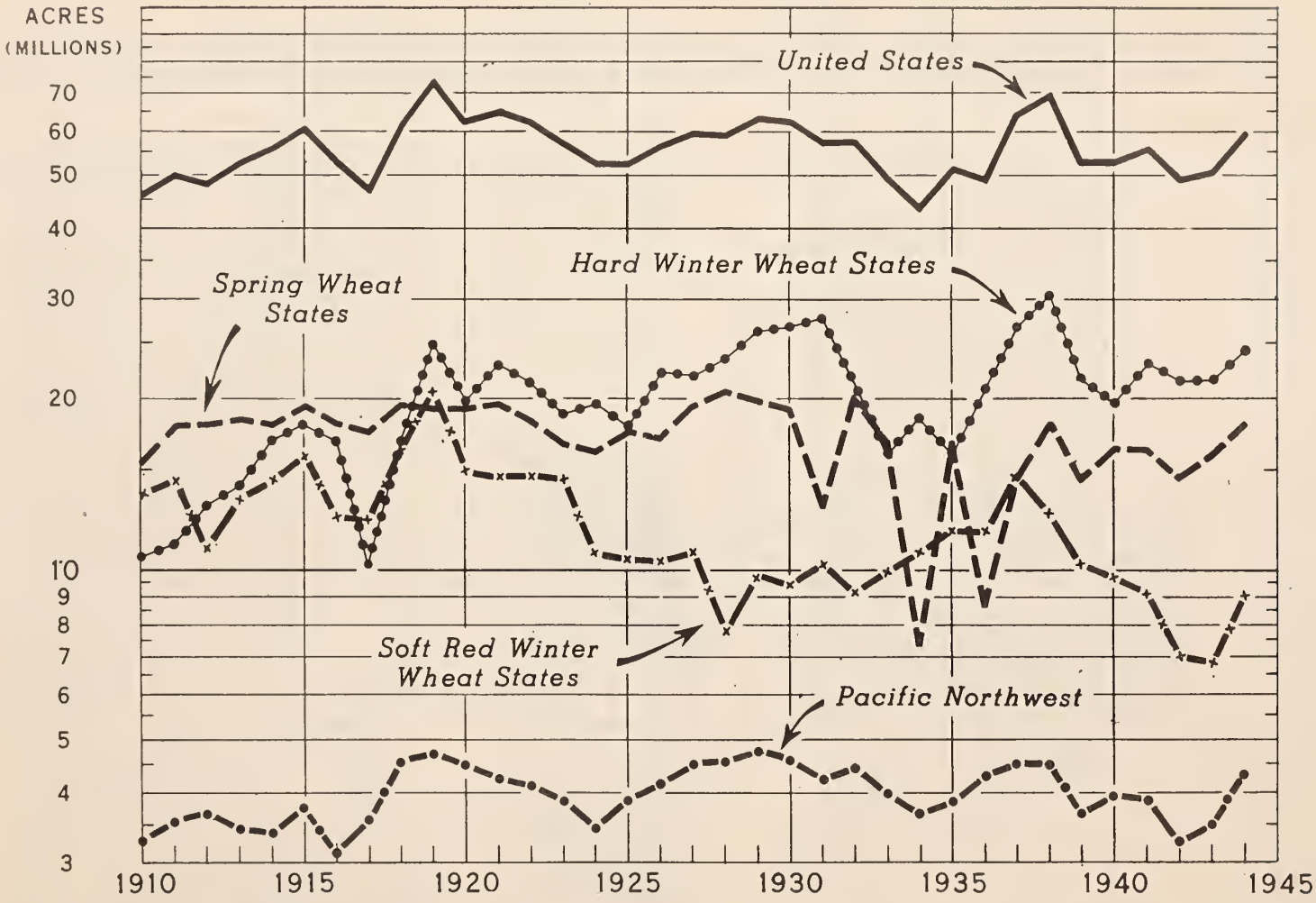
	Page
Introduction	1
Acreage trends	2
World War I	2
The 1920's	2
The 1930's	5
World War II	7
Highlights on acreage trends	7
Wheat yields	8
Yield trends	8
Factors causing lowered yields	9
Improvement in wheat yields	11
Yield summary	14
Farm size and mechanization changes	15
Wheat production	19
In World Wars I and II	19
Production changes by wheat regions	20
Fluctuations in production	20
Wheat utilization	22
Postwar prospects	23
Postwar outlets for wheat	23
Wheat supply prospects	27
Implications	29
Alternative wheat policies	30
Parity price with production control and marketing quotas	31
Two-price system	32
Free market price with no controls	35
A conversion program	36

INTRODUCTION

The position of wheat and the welfare of wheat farmers in postwar years are subjects of increasing concern. This report appraises the production and utilization situation in general terms, and presents the major alternatives in policy that are available, together with an indication of the results that may be expected from the adoption of each. Trends in acreage and yield and reasons for changes are discussed. A clear understanding of these changes seems basic to intelligent selection among alternative policies regarding wheat. Therefore the background materials are presented before the alternative policies and implications.

Production of wheat in the United States may be briefly characterized: (1) Wheat is second to corn as the Nation's most important cereal crop, (2) it normally occupies about one-sixth of the Nation's cropland and is grown in nearly every State, (3) it is almost the sole source of cash-crop income in large subhumid areas and it is also grown in rotation with other crops under humid conditions, (4) mechanization of cultural and harvesting operations has proceeded further with wheat than with any other major crop, with wheat production highly mechanized in the large specialized areas, and (5) domestic needs for food uses are normally less than the quantity produced and at times of limited export-market outlet Government action has been necessary in order to dispose of the surpluses.

ACREAGE OF WHEAT HARVESTED, UNITED STATES AND MAJOR WHEAT REGIONS, 1910-44



U. S. DEPARTMENT OF AGRICULTURE NEG. 45201 BUREAU OF AGRICULTURAL ECONOMICS

Figure 2.- Acreage of wheat harvested in the hard winter wheat States increased from about 10 million in 1910 to almost 25 million in 1919 and has averaged well over 20 million acres since then. Sharp declines in acreage harvested occurred during the drought years of the 1930's in both the hard winter and spring wheat States. Direct comparisons of percentage changes can be made on this semilogarithmic chart.

Table 1.- Acreage of wheat harvested, United States and by groups of States, 5-year averages 1910-44, annual 1941-44

Year	Hard winter wheat States		Spring wheat States		Soft red winter wheat States		Pacific Northwest States		All other States		United States	
	Million acres	Percent	Million acres	Percent	Million acres	Percent	Million acres	Percent	Million acres	Percent	Million acres	Percent
Average:												
1910-14	13.1	26	17.4	35	13.2	26	3.5	7	3.1	6	50.3	100
1915-19	17.3	29	18.6	31	15.4	26	3.9	7	3.9	7	59.1	100
1920-24	20.5	34	17.9	30	13.8	23	4.0	7	3.3	6	59.5	100
1925-29	22.3	38	18.9	32	9.8	17	4.4	8	2.9	5	58.3	100
1930-34	22.1	41	15.2	28	9.9	18	4.2	8	2.8	5	54.2	100
1935-39	23.1	41	14.4	25	12.2	21	4.2	7	3.4	6	57.3	100
1940-44	22.1	41	16.2	30	8.4	16	3.8	7	3.1	6	53.6	100
1941	23.1	42	16.3	29	9.2	16	3.9	7	3.1	6	55.6	100
1942	21.4	44	14.4	29	7.0	14	3.3	7	3.1	6	49.2	100
1943	21.6	43	15.9	31	6.9	14	3.5	7	2.7	5	50.6	100
1944	24.4	41	18.1	31	9.1	15	4.3	7	3.4	6	59.3	100

Table 2.- Acreage of wheat planted, United States and by groups of States, 5-year averages 1920-44, annual 1941-44

Year	Hard winter wheat States		Spring wheat States		Soft red winter wheat States		Pacific Northwest States		All other States		United States	
	Million acres	Percent	Million acres	Percent	Million acres	Percent	Million acres	Percent	Million acres	Percent	Million acres	Percent
Average:												
1920-24	23.5	36	18.6	29	14.7	23	4.3	7	3.5	5	64.6	100
1925-29	26.2	40	19.7	30	11.6	18	4.8	7	3.0	5	65.3	100
1930-34	28.3	42	19.9	30	10.3	15	5.0	8	3.2	5	66.7	100
1935-39	32.0	44	20.0	27	12.9	18	3.7	6	3.6	5	73.2	100
1940-44	25.9	44	17.0	28	9.1	15	4.1	7	3.3	6	59.3	100
1941	27.7	44	16.8	27	10.2	16	4.1	7	3.5	6	62.3	100
1942	23.0	44	14.8	28	7.7	15	3.5	7	3.2	6	52.2	100
1943	23.3	42	17.0	31	7.7	14	4.2	8	2.9	5	55.1	100
1944	28.7	44	19.1	29	9.7	15	4.6	7	3.6	5	65.7	100

humid areas, as in the soft red winter wheat region, a marked downward trend in acreage occurred which was offset by shifts to other crops. In contrast to these shifts, wheat acreage increased in the western parts of the two regions, which comprise a major part of the Great Plains. Because of the highly variable rainfall in these regions wheat production is a high-risk enterprise. But despite the high risk, much of the land is best suited to wheat and opportunities to shift to other crops are extremely limited.

"Plowing of the Plains" which had a good start during World War I continued on a large scale during the 1920's although there was considerable abandonment of land that had been plowed during World War I, which was later found to be unsuited to continued cultivation. The influence of this expansion reversed the trend of seeded wheat acreage in the United States and started it upward in 1925. The downward acreage trend in the soft red winter wheat region and in the eastern parts of the hard red winter and spring wheat regions as well as in the minor wheat areas continued after 1925, although on a more moderate scale than before. But in the Great Plains areas of the spring and hard winter wheat regions, the acreage in this crop continued to increase rapidly. An upward trend also started in specialized wheat areas of the Pacific Northwest in the middle 1920's.

Improvements in tractor power and the introduction of the prairie-type combined harvester-thresher gave great stimulus to expanding the wheat acreage in the Great Plains and Pacific Northwest in the 1920's. The number of combines on farms in the United States increased from 4,000 to 61,000 between 1920 and 1930, and were concentrated mainly in these specialized wheat areas. During the same period the number of tractors on farms in the United States increased from 246,000 to 920,000 and motor-trucks increased from 139,000 to 900,000. With this type of mechanization the amount of labor used in wheat production was only about half of the former requirements.

The 1930's

From 1930 to 1935 the seeded acreage in the United States ranged between 64 and 69 million acres. Because of severe drought in some of these years the harvested acreage ranged between 43 and 63 million acres. Following 1935, the planted acreage reached an all-time high of 81 million acres in 1937, and then dropped to 62.5 million in 1939. Causes for these acreage shifts in the 1930's are difficult to isolate and evaluate. Droughts, the prices of other products, and Government programs influenced the acreage planted in the different years.

The extreme price drop in the early 1930's did not materially affect the total seeded acreage in the United States, nor the seeded acreage in major wheat regions. For the 1929 wheat crop, the United States average price per bushel of wheat received by farmers was approximately $1.04. For the 1931 crop it was $0.39 and it reached a low point of $0.38 for the 1932

crop. Farmers in the specialized wheat areas received even lower prices. For example, the average price for the 1932 crop in Oklahoma was $0.32.

The United States average price rose to $0.74 for the 1933 crop. The acreage had then reached a low level in the more humid areas where there were some alternatives, but in the specialized wheat areas of the Great Plains and Pacific Northwest there were no practical alternatives. But with the upturn in prices, which started in 1933 and continued through 1937, wheat acreage increased rapidly in the more humid soft red winter wheat region and in the eastern portions of the hard winter and spring wheat regions. More wheat was seeded in the Corn Belt in 1937 than in any year since 1920.

In the Pacific Northwest, seeded wheat acreage had been gradually increasing; it reached a peak in 1933, dropped sharply in 1934, and then increased gradually to 1937. Increased acreage by farmers who were not participating in the adjustment program was probably in part responsible for the increase.

Acreage increased somewhat after 1934 in the hard winter wheat region. In the more humid areas of the region, as in the soft red winter wheat region, wheat was in a relatively favorable position compared with other crops during this period. The corn-acreage adjustment program, and the disappointing rainfall which was less than normal, influenced the wheat-acreage expansion in the more humid areas. The trend in the wheat acreage was upward in the eastern part of the spring wheat region, although the region as a whole did not expand because of severe drought in the western areas. During these drought years Government payments to farmers were almost the sole cash income that many had--they were getting little more in the way of production than enough to reseed the land. Undoubtedly, a considerable area would have been forced out of wheat production if Government payments had not been available. This would have meant suffering and distress to a large number of farm families.

As a result of a record world wheat crop in 1938, the United States farm price dropped from an average of 96.2 cents per bushel for the 1937 crop to 56.2 cents for the 1938 crop. The acreage allotted for seeding to wheat for the 1939 crop under the new Agricultural Adjustment Act of 1938 was 55 million acres, compared with the 79 million acres seeded for harvest in 1938. The effect of the price drop on wheat acreage in the more humid areas, and the effect of the new program in the more specialized wheat areas caused the acreage seeded for harvest in 1939 to drop to 63 million acres. Reductions occurred in all regions. About 73 percent of the wheat growers in the United States complied with the Government program in 1939--a much higher percentage than formerly took part.

A sharp downward trend of acreage was reversed after 1930 in the South as wheat became more generally used in the rotation (fig. 3). This is the only region in which wheat acreage during World War II has been above the acreage of the late 1930's. Yields in the South have been greatly

improved so that production has increased threefold since 1930. Although this region is a small part of the total wheat picture, the relative importance of wheat has increased rapidly there and it is becoming an important crop for some local areas of the South.

World War II

The wheat acreage of the United States continued to decline until 1943. A similar trend occurred in all major wheat regions, and was most pronounced in the soft red winter wheat region. In the early years of World War II the Government wheat-adjustment programs continued in effect as stocks on hand were abnormally large. War requirements for many farm products other than wheat were high, and farmers were urged to keep wheat acreage low and to plant such crops as flaxseed, dry beans, soybeans, and dry field peas. Prices for the alternative crops that were being encouraged by the Government were very favorable, and this, combined with strong educational programs, served to increase the acreage of other crops and to help keep the acreage of wheat at a relatively low level. The 52 million acres seeded in 1942 were the all-time low since estimates were first made in 1919. Favorable weather, resulting in record yields of wheat, influenced somewhat the Government's wartime agricultural production program with respect to wheat acreage. In 1943 the acreage of seeded wheat increased in all regions and totaled 55 million acres--the acreage allotment for the United States under the Agricultural Adjustment Agency. The acreage seeded in 1944 showed a sharp increase to 65.7 million acres primarily as the result of the removal of acreage restrictions, the encouragement of acreage increases, and the favorable price situation.

Highlights on Acreage Trends

Some of the major trends in wheat acreage and the way in which acreage has responded to various influences are significant. These are here summarized.

1. Following World War I an increasing proportion of the wheat acreage of the United States has been concentrated in the Great Plains parts of the hard winter and spring wheat regions. Acreage planted in the Great Plains States increased from 61.5 percent of the United States total for the period 1920-24 to 70 percent for the period 1930-34, and has held fairly constant since then.

2. There has been a long-time downward trend in acreage in the more humid areas of major wheat production--the soft winter wheat regions and the eastern portion of the hard winter and spring wheat regions. This trend was reversed temporarily in the middle 1930's because of price relationships favorable to wheat production, and because wheat was a better drought crop than corn in these areas.

3. The effect of price relationships on wheat acreage is significant. In the more humid areas mentioned above, wheat acreage is more responsive to price relationships than it is in the specialized areas of the Great Plains and Pacific Northwest. Although there is a limit to the downward adjustment in acreage in the more humid areas because of the minimum needed in rotations, there is considerable latitude above this minimum level in which the acreage fluctuates, influenced by the competitive position of wheat. In contrast to this, acreage in the Great Plains, and in specialized wheat areas of the Pacific Northwest, does not go down when prices for wheat drop, because there is a lack of alternatives as a major source of cash income. In parts of the high-risk crop-production areas the only alternative is to shift to a grass economy for the production of range livestock. This is a radical shift which can be made only over a period of years and requires adjustments in size of farms as well as in the products grown.

4. Seeded wheat acreage in the United States climbed to an all-time high in 1937. The acreage-adjustment program for wheat was not really effective until 1939--partly because of the changes that the program was undergoing, and partly because of the effect of the drought in limiting alternatives to wheat production at the same time that surpluses were reduced and price conditions improved. The program introduced in 1938 with its new features of conservation, marketing quotas, loans, and crop insurance was more effective in achieving acreage reduction.

5. Under the adjustment program acreage was reduced to 52.2 million planted acres in 1942, but after restrictions were removed in 1943 the acreage of wheat planted rose in 1944 to 65.7 million acres and to 68.6 million acres in 1945.

WHEAT YIELDS

Wheat yields have averaged 14.3 bushels per harvested acre in the United States for the 35-year period 1909-44. National wheat yields are subject to considerable yearly fluctuation. They have been as low as 11.2 bushels per harvested acre in 1933 and as high as 19.8 bushels per acre in 1942. Yields on a planted-acreage basis have varied even more, from a low of 8.0 bushels to a high of 18.7 bushels for the respective years above.

Yield Trends

There is no clearly defined trend in national average wheat yields (see cover page). However, a moderate upward trend in yields is apparent in the period 1916 to 1931. This period, although characterized by considerable annual fluctuation in yields, was not influenced either by extended droughts or by long periods of abnormally high precipitation. A long-time trend toward higher yields on land of a given level of productivity may be indicated, since a considerable shift in wheat acreage from

high-yielding to low-yielding areas occurred during this period. Under the influence of the prolonged drought of the 1930's, and some years of heavy damage through rust, yields remained low for several years. However, from the low point in 1933 the direction of change has been upward to reach a new high level from 1941 through 1944.

Violent fluctuations in yield in both the hard winter and spring wheat regions materially affect the national average yield (fig. 4). Fluctuations in yields in these two regions have been greater both on an absolute and on a percentage basis than in the soft red winter or Pacific Northwest wheat regions. For example, in the spring wheat region the average yield per planted acre in 1936 was only 2.5 bushels, and in 1942 it was 19.8 bushels. With this great range in yields, which results mainly from variations in weather conditions, it is extremely difficult to analyze and measure in quantitative terms the effects of the efforts to improve the yield that have been and are being made, or to discern much trend toward improvement in yields.

Although no upward trend in yields is apparent in the hard winter and spring wheat regions during the last 25 years, yields have been fairly well maintained in the face of an increasing proportion of wheat being grown in areas of poorer climate and soil. An upward trend in yields occurred in the Pacific Northwest and in the soft winter wheat regions. The 5-year moving averages of yields shown in the figure on the cover page bring out more clearly the persistent changes.

There is a definite upward trend in yields in the Southeastern States and a more moderate upward trend in the Northeast. Wheat is of limited commercial importance in these two regions.

Factors Causing Lowered Yields

Drought is probably the greatest hazard to wheat production. It is the major cause of recurring extremely low yields in the large specialized areas. Other adverse weather conditions, such as wind, water erosion, and winterkilling, also reduce the yields. Plant diseases and insects cause some reduction nearly every year and sometimes the outbreaks are severe. Poor management, especially in the timing of farm operations, tends to reduce the yields and the shifting of wheat acreage to lower yielding lands tends to lower the national average yields.

The Influence of Weather

Each year a considerable acreage of land seeded to wheat is not harvested. The high percentage abandonment in the spring and hard winter wheat regions is primarily caused by the abnormally small amount of precipitation received there in some years (fig. 5). In addition to the large

acreage abandoned in some years, yields are reduced on the acreage that is harvested.

The close correlation between planted-acreage yields and precipitation--particularly in the hard winter, spring, and Pacific Northwest wheat regions--is illustrated by the relationship of precipitation in certain months to wheat yields in Kansas and North Dakota (fig. 6).

Winterkilling as a result of unfavorable weather sometimes has caused large acreage abandonment and lower yields from the seeded acreage in certain areas. The 44-percent abandonment in the soft red winter wheat region in 1928 came from winterkilling and this was the reason for the high abandonment in the Pacific Northwest in the years 1925 and 1933.

Shifts in Areas of Wheat Production

Average yields in some of the major regions, particularly the hard winter and spring wheat regions, have been affected by shifts in areas of wheat production. As an illustration of the type of shift that has occurred in both regions, wheat acreage in Kansas increased in the western part and decreased in the eastern part from 1919 to 1933 (fig. 7). Yields in the western part of the State are lower than in the eastern because of lower annual rainfall. This shift to drier, lower-yielding areas is one of the major reasons why the yield of wheat in the United States has shown no appreciable upward trend.

Wheat Diseases

Diseases such as stem and leaf rust, bunt or stinking smut, loose smut, root rot, and scab, cause large losses to the wheat crop each year. The rusts are most destructive in the spring wheat region, smut in the Pacific Northwest, and scab does the most damage in the soft red winter wheat region, particularly in the Corn Belt. In years when these diseases are severe, yields are lowered materially. Estimates of crop losses due to plant diseases indicate that in years of severe epidemics reductions in production are notable (fig. 8). Considerable progress in the control of diseases has apparently been made during the period of record, though severe epidemics occurred in 1935, 1937, and 1938.

Black stem rust is one of the worst diseases of the wheat plant. In epidemic form it has caused losses up to 200,000,000 bushels of wheat in a single year. Stinking smut causes considerable damage; it not only reduces the yield but makes the grain undesirable for milling until the smut is removed. The other wheat diseases cause lower yields. Control measures are becoming more and more effective for all diseases.

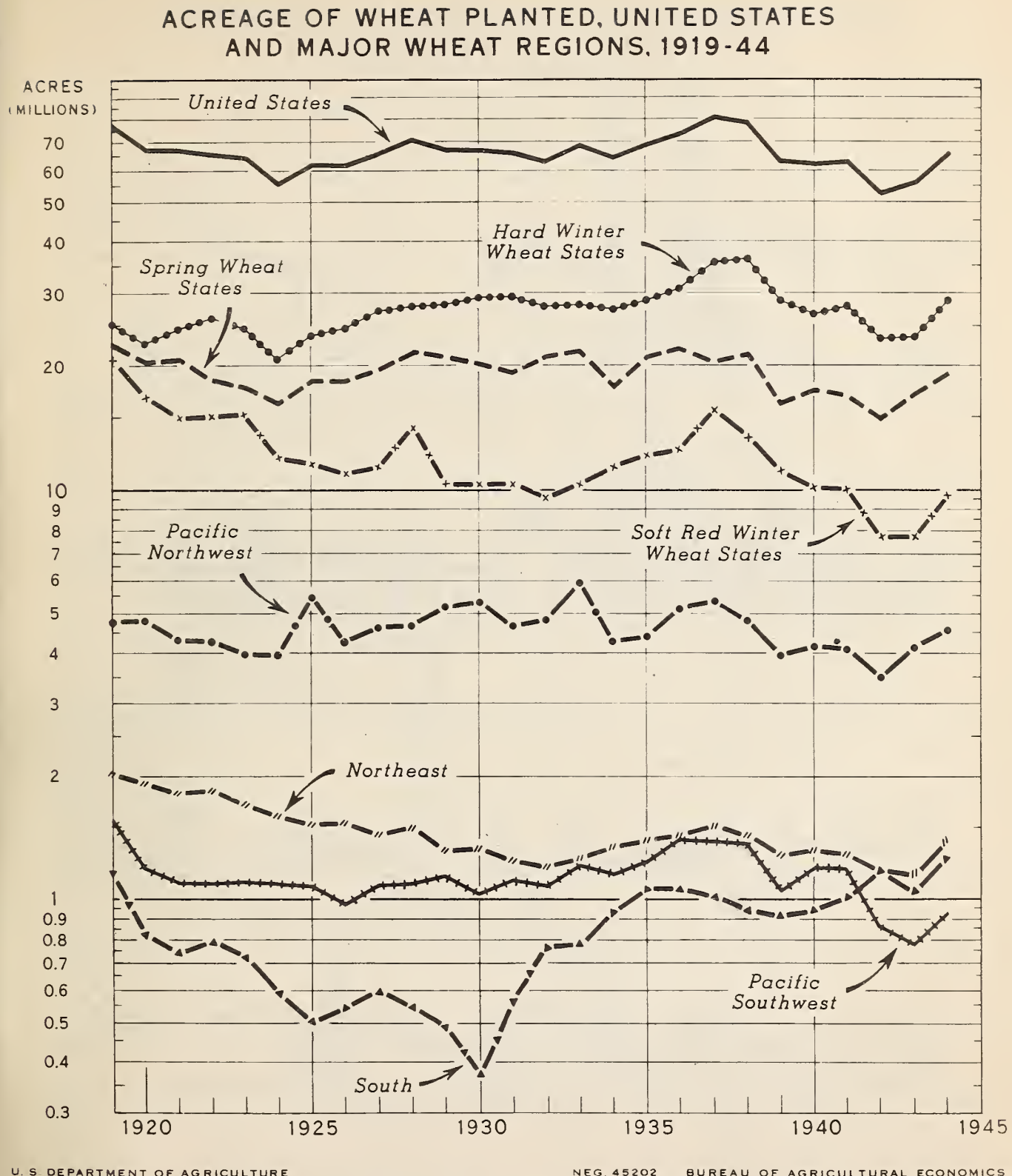


Figure 3.- Planted acreage of wheat in the United States reached an all-time peak of more than 80 million acres in 1937, largely because of increased plantings in the hard winter and soft red winter wheat States. Acreage in the soft red winter wheat States during the early 1940's was less than half the 1919 acreage. The acreage change in the South has been upward since 1930.

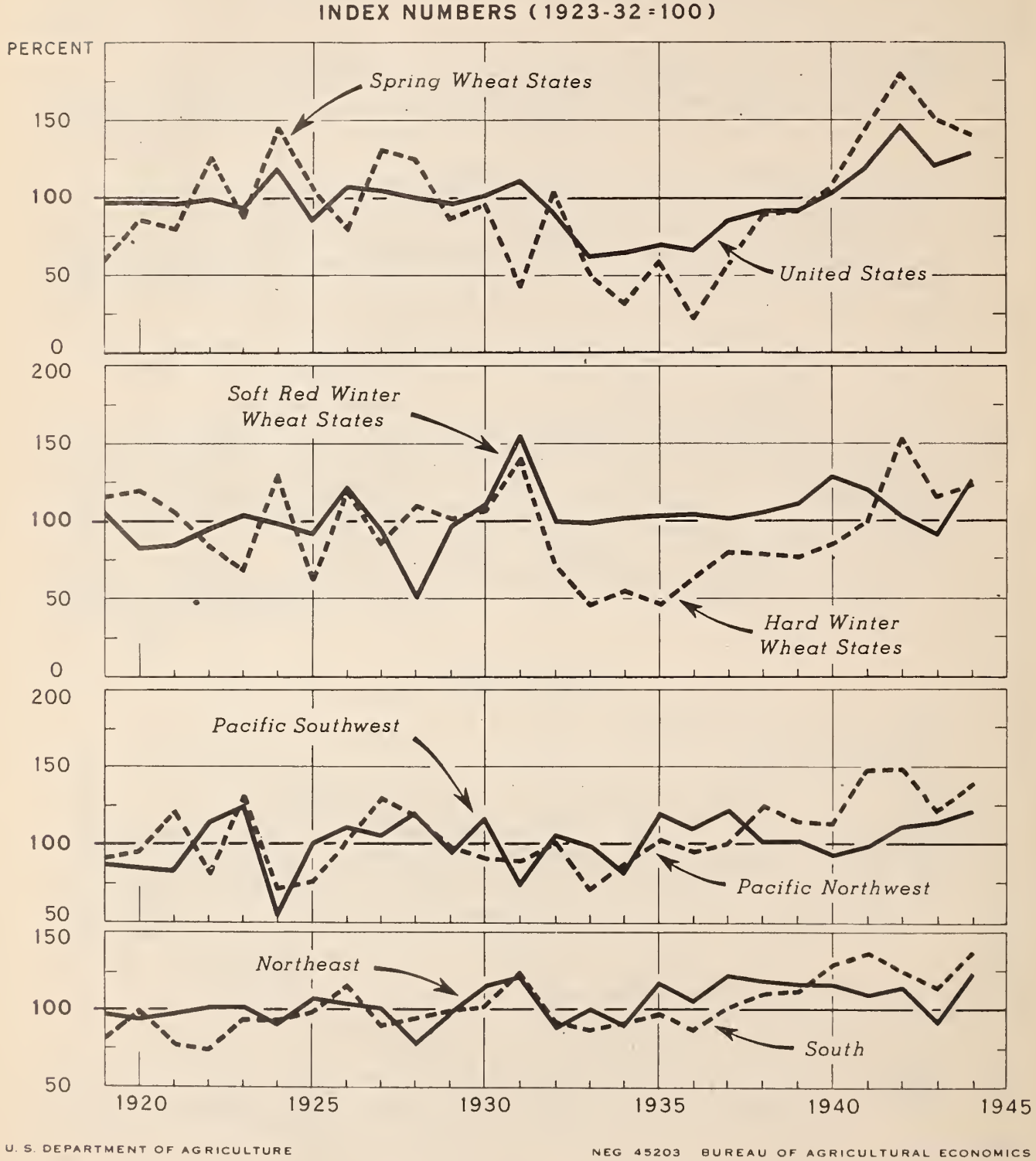


Figure 4.- Yields of wheat have been above the 1923-32 average in most years since 1940 for all of the wheat regions. Yields in the hard winter and spring wheat States did not return to the predrought level until about 1940. Yields in the Pacific Northwest and the Southern States since 1938 have been materially higher than during the 10-year 1923-32 period.

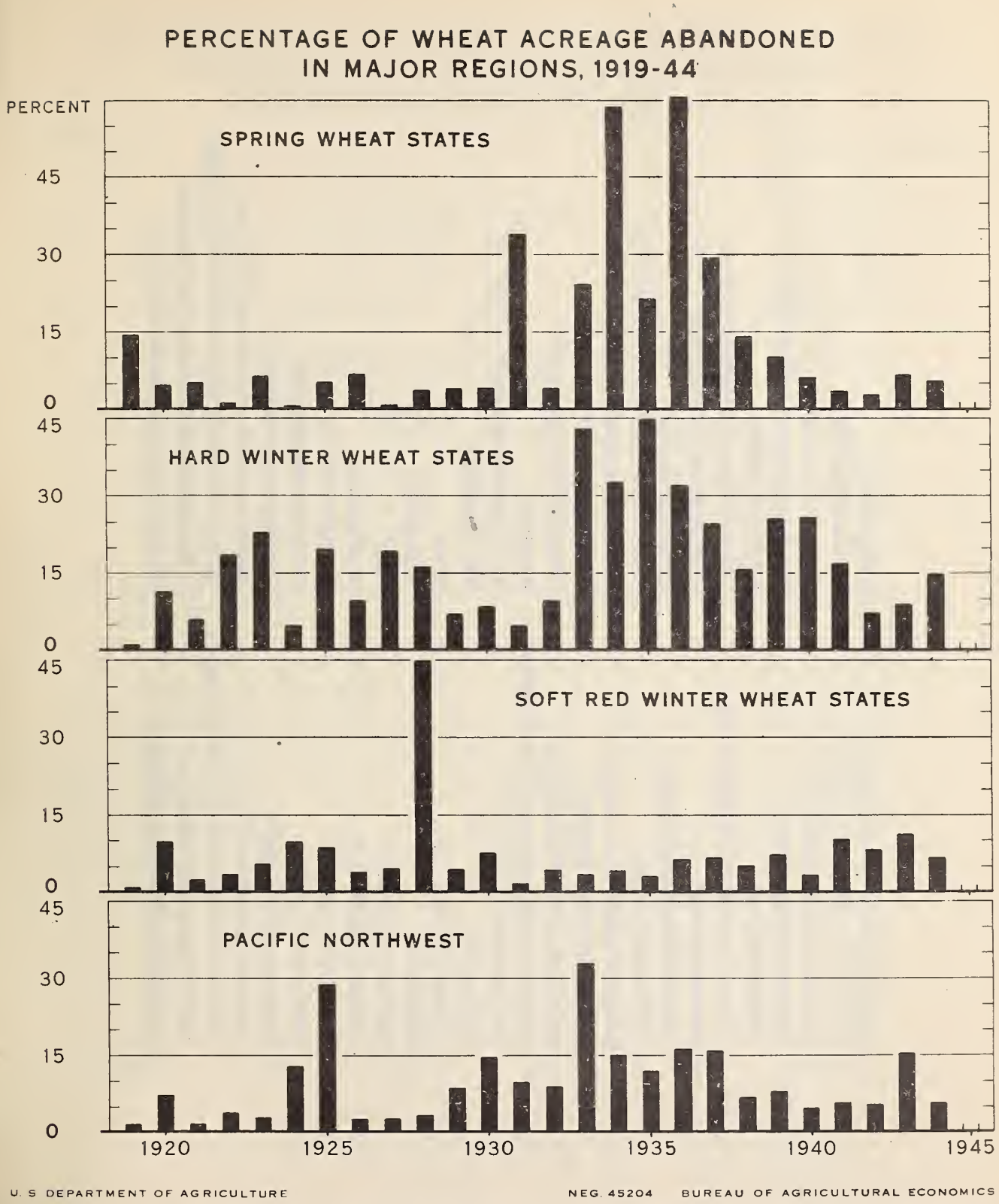


Figure 5.- Normally a larger percentage of the acreage planted is not harvested in the winter wheat States than in the spring wheat States, although acreage abandonment of about 60 percent occurred in the hard spring wheat States in the drought years of 1934 and 1936. Only once since 1919 has abandonment exceeded 10 percent in the soft red winter wheat States.

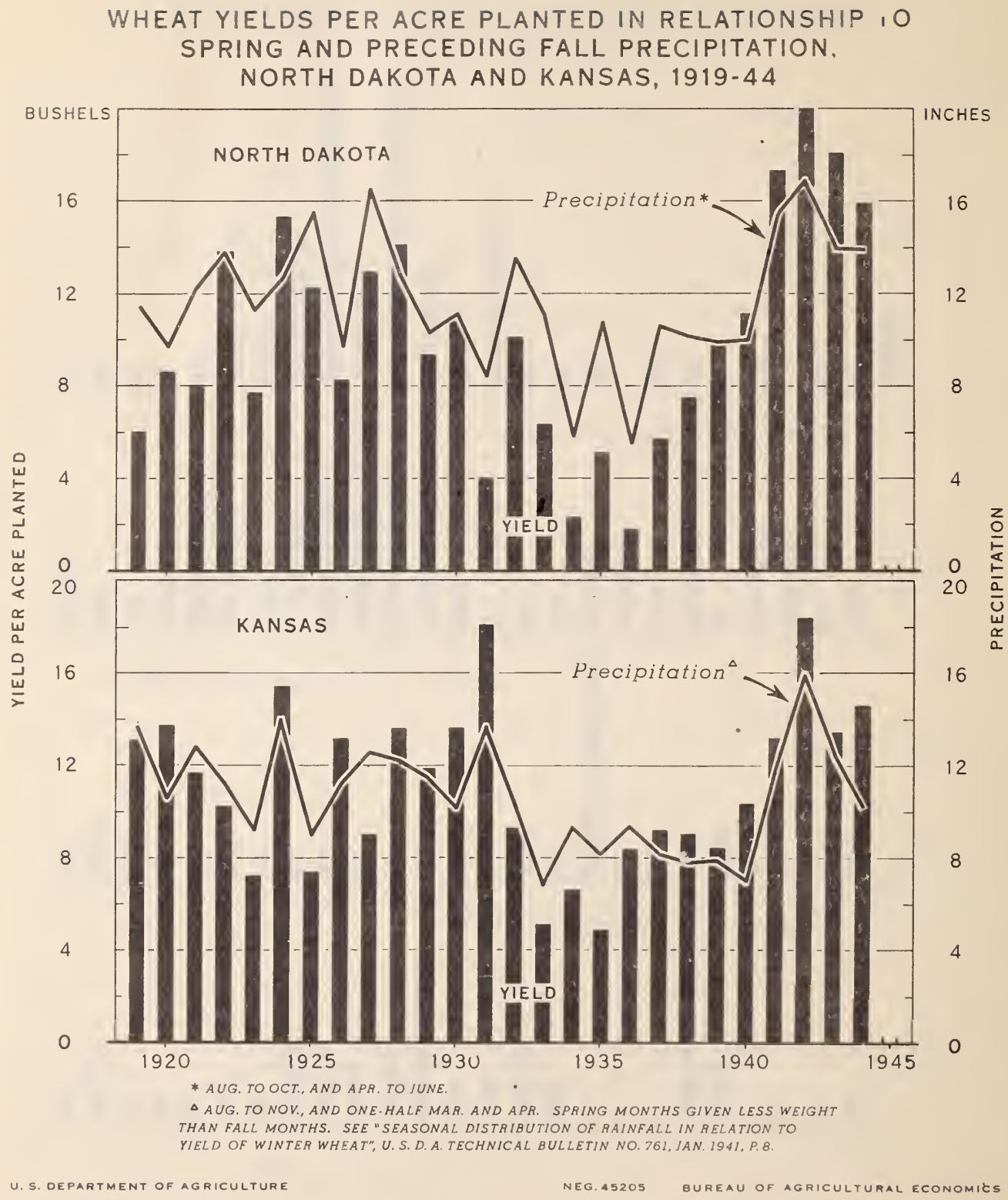


Figure 6.- Wheat yields in the specialized wheat-producing areas fluctuate primarily because of variations in the amount of rainfall, although other factors such as temperature and disease damage are important. (Precipitation in Kansas was weighted by the acreage of wheat planted in the eastern, central, and western part of the State. North Dakota precipitation is the State average as reported by the United States Weather Bureau).

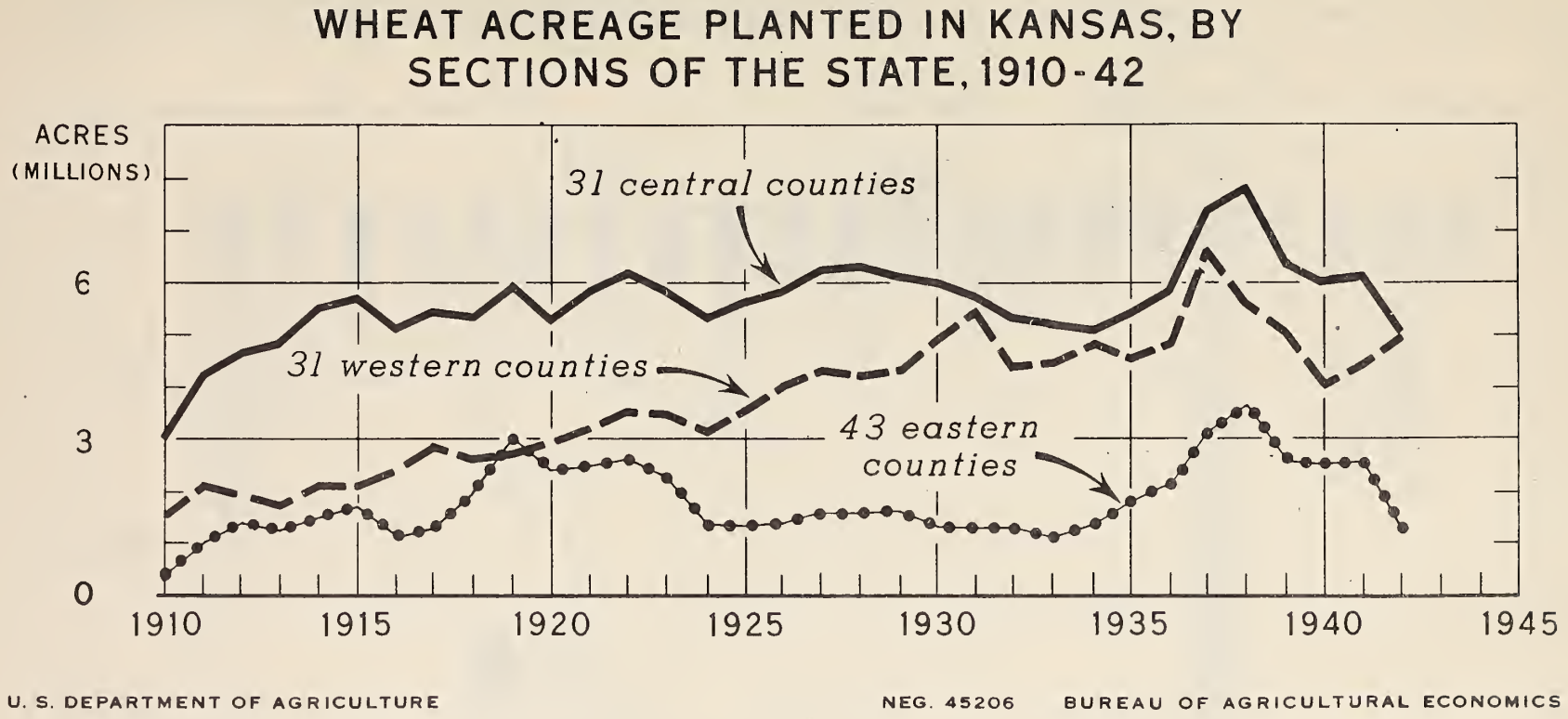


Figure 7.- Wheat acreage in the western counties where yields are relatively low increased rapidly and fairly consistently until 1937. Acreage in the eastern counties declined after World War I, but increased sharply during the drought years of the middle 1930's chiefly because wheat is a better drought crop than corn in the more humid areas. (Data from biennial reports of the State Board of Agriculture, Kansas).

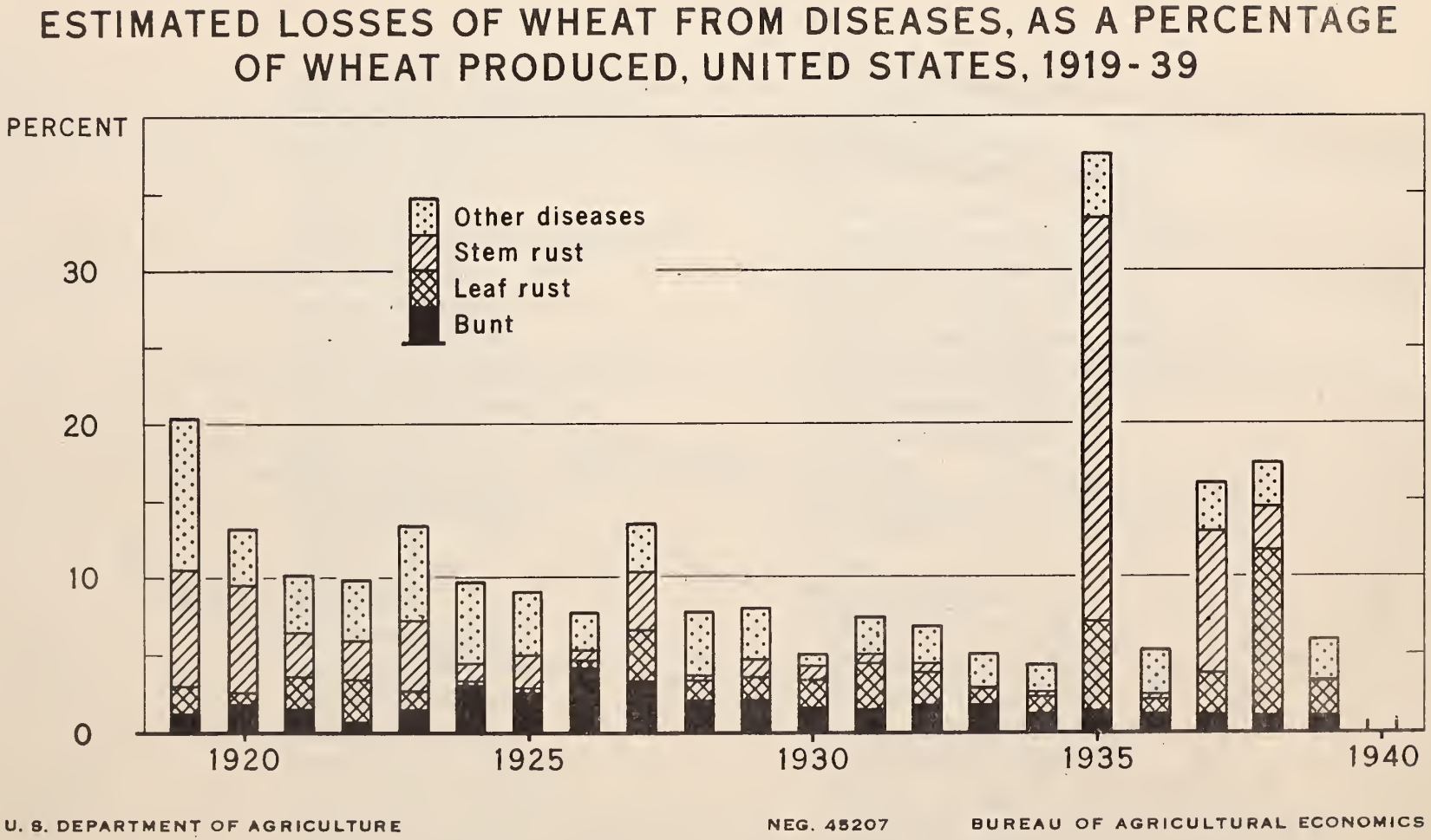


Figure 8.- Notable progress in reducing the loss of wheat from diseases was made during the 1920's and early 1930's. Outbreaks of both stem and leaf rust in epidemic form occurred in several years of the 1930's. Data are not available since 1939 but, in general, disease losses have been moderate during recent years. (Data from published reports of the Bureau of Plant Industry, United States Department of Agriculture).

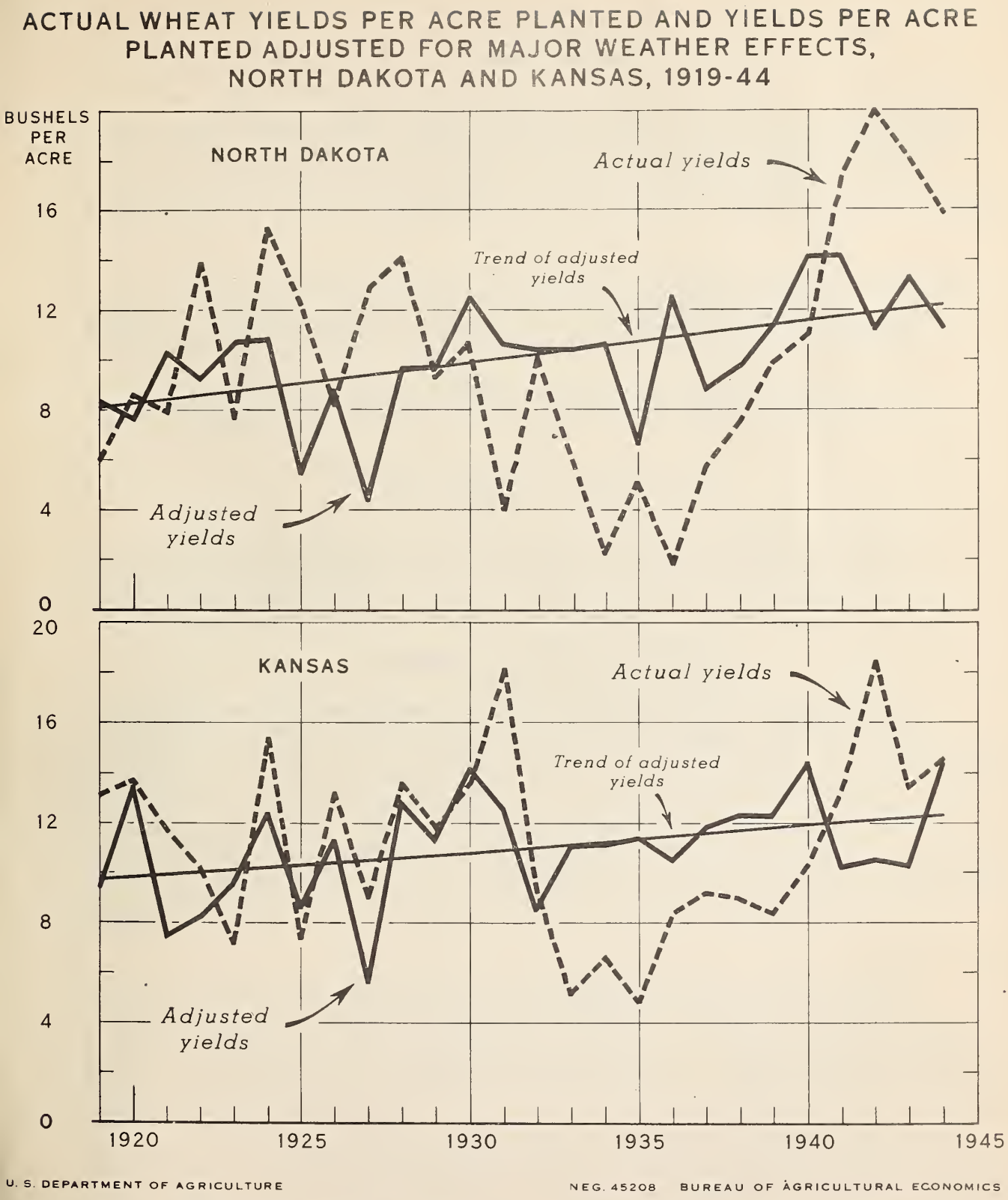


Figure 9.- A definite upward trend in wheat yields is apparent for both North Dakota and Kansas after adjusting for major effects of precipitation and temperature (adjusted yields are the net regression of yield on "time" with precipitation and mean temperatures for selected months held constant). (See fig. 6 for precipitation data used.)

Insect Pests

The hessian fly and the chinch bug are probably the most destructive insect pests of the crop. Damage from the hessian fly has been estimated at 100 million dollars for a single year and the average annual loss at 48 million dollars. 2/ Most damage is done in the winter wheat regions. Crop rotations, cultural practices, and new varieties are used in the control of this pest.

It has been estimated that the chinch bug causes an annual loss of about 14 million dollars to the wheat crop in the United States. 3/ Weather seems to be the most important factor in determining the abundance and occurrence of chinch bugs. Most damage is done in the central States.

Grasshoppers, Mormon crickets, sawfly, and other insects cause severe damage to the crop in certain areas and in certain years.

Improvements in Wheat Yields

Efforts to counteract yield losses from such factors as weather, diseases, and insect pests, and to maintain and improve yields have been under way for many years.

Measurement of Increased Yields

Results of these efforts are difficult to measure when yields fluctuate so widely from year to year and from period to period. When the effects of some of the important factors of precipitation and temperature on yields are measured there appears to be good evidence that definite increases in yields have occurred over a period of years. The upward trend is illustrated in the case of yields in North Dakota and Kansas (fig. 9). Actual yields in these States were adjusted for the major effects of precipitation and temperature so that the underlying trend would be more discernible. These two States normally produce about 30 percent of the Nation's total wheat production.

In Kansas and North Dakota there appears to be a rather definite upward trend in adjusted yields over the 25-year period--in each case about an average of 3 bushels an acre increase. In other words, with similar precipitation and temperature conditions a yield of about 3 bushels more can be expected now compared with 25 years ago. This represents substantial progress, as it means an increase of 25 to 30 percent in the average yields of those two States.

2/ Hyslop, J. A., An Estimate of the Damage by Some of the More Important Insect Pests in the United States, U. S. Bur. Ent. and Plant Quar., 21 pp. 1930 (Processed).

3/ See footnote 2.

These increases in yield are the result of many factors, including widespread adoption of improved varieties, better methods of disease and insect control, increased use of summer fallow, and other improved management and conservation practices. Mechanization, especially the increased use of tractors, has materially aided in improving the timing of farm operations. These increases have occurred in Kansas and North Dakota despite a considerable shifting of acreage to lower yielding wheat land.

New Varieties

New varieties that lessen the hazards to wheat production are continually being developed. Marked improvement in yields has resulted from the use of new disease-resistant, drought-resistant, pest-resistant, and higher-yielding varieties. Because of the effect of shifts in production to lower-yielding areas, of soil depletion, and changes in cultural practices, the exact effect of the use of the improved varieties on average yields cannot be ascertained. However, experimental tests with the new varieties show a considerable yield-increasing effect. Wheat yields would be much lower today if varietal improvements had not effectively served to meet the increasingly unfavorable situations.

The hard winter wheat varieties, Comanche, Pawnee, and Wichita, are examples of some of the latest developments. It is believed that they will be desirable for growing in the southern Great Plains, each adapted to particular areas. Comanche is resistant to the generally prevailing races of stinking smut and leaf rust, has stiff straw and hence does not easily lodge, and matures early--thus often escaping damage by stem rust and the midsummer drought which frequently injures later maturing varieties. In experimental trials throughout the area, it has outyielded some of the well-known varieties such as Turkey, Tenmarq, and Blackhull, and is equal to the best of them in quality. Pawnee and Wichita also have improved characteristics over most varieties in certain areas.

The varieties Mida and Newthatch are examples of late developments in hard red spring wheat and Carleton and Stewart among the durum wheats. For instance, Newthatch is very similar to the outstanding stem rust-resistant variety Thatcher except that it is resistant to leaf rust, whereas Thatcher is not.

New soft winter wheats have been developed that show more disease resistance and higher yields, yet they have good quality and, in some instances, are more satisfactory than older varieties for harvesting with the combine, which is being used more and more in the eastern United States. In far Western States, new varieties have been developed that show more resistance to rusts, smut, and hessian fly.

Improvement in Farming Methods

Farmers are using better cultural and other farming methods, including more timely operations, greater use of summer fallow, strip cropping both straight and contour, and improved rotations.

Mechanization of wheat farming did much to improve timeliness of operations. Experimental results have shown considerable increases in yields directly attributed to timely operations. Time of plowing and seeding are especially important.

The use of summer fallow has done much to maintain and improve the yields, particularly in certain areas of the hard winter, spring, and Pacific Northwest wheat regions. Experimental data show that a substantial increase in yields is possible in many, though not all, areas from the use of summer fallow (table 3).

Table 3.- Wheat yields under three systems of production 1/

Location	Type of wheat	Yield per acre when in wheat		
		Continuous wheat	Fallowed land (alternate years)	Disked corn-land
		Bushels	Bushels	Bushels
Garden City, Kans.	Winter	9.3	19.3	---
Fort Hays, Kans.	Winter	16.5	23.5	---
Ardmore, S. Dak.	Winter	9.5	19.9	14.1
Ardmore, S. Dak.	Spring	11.9	20.7	17.4
Dickinson, N. Dak.	Spring	11.0	21.2	18.1
Havre, Mont.	Spring	10.3	16.4	12.1

1/ Elwood, R. B., Arnold, L. E., Schmutz, D. C., and McKibben, E. A. Changes in Technology and Labor Requirements in Crop Production: Wheat and Oats. U. S. National Research Project Rpt. A-10, 182 pp., illus. Washington, D. C. (See p. 74).

Acreage of summer fallow has increased substantially within recent years, particularly in the Great Plains areas of the spring and hard winter wheat regions. Most of the fallow land is seeded to wheat. In the six States for which data are available (Kansas, Nebraska, Colorado, Wyoming, Montana, and South Dakota) the acreage of summer fallow totaled roughly 2⅔ million acres in 1928. This had increased to about 9⅔ million acres by 1939. Some decline has occurred during the war years because of the pressure for increased crop production to meet wartime requirements, with from 2 to 3 million acres temporarily diverted to other uses. Although the effect on average yields cannot be measured exactly, the possible increases in yield shown in table 3 and the increasing use of summer fallow suggest that substantial increases in yields have come from this practice.

Use of contour farming and strip cropping as erosion-prevention measures has increased. An increase in the acreage strip cropped and strip fallowed in the United States from less than 1 million in 1937 to more than 8 million in 1942, is reported by the AAA. The major use of this practice is in connection with wheat production in the hard winter and spring wheat regions.

More desirable rotations in the more humid areas have been effective in maintaining or increasing yields. Use of fertilizer has increased considerably. The upward trend in yields in the Southeast has resulted primarily from this practice and from the introduction of new higher-yielding varieties.

Yield Summary

Significant facts about wheat yields may be summarized.

1. Wheat yields in the United States vary greatly from year to year and from period to period, influenced primarily by weather.

2. Greatest obstacles to obtaining higher yields are drought, diseases such as stem rust, which sometimes occur in epidemic form, and insects such as the hessian fly and chinch bug--with drought by far the greatest hazard.

3. The greatest contributions toward increasing the yields have been made through varietal improvements to combat drought, diseases, and insects, through greater use of soil and moisture-conserving practices such as summer fallow, and through mechanization by improving timeliness of operations.

4. A definite upward trend in yields is apparent in the soft red winter and Pacific Northwest wheat regions.

5. After-adjustment for the major effects of precipitation and temperature an increase of 25 to 30 percent in yields is indicated for Kansas and North Dakota over the last 25 years, which probably means significant improvement in yields in both the hard winter and spring wheat regions.

6. National wheat yields have been very high since 1940, averaging 16.4 bushels per acre planted for the period 1941-44 as compared with 10.4 bushels in the immediate prewar period 1935-39, and 12.3 bushels for the period 1919-23. The 6-bushel increase from the 1935-39 average yield to the 1941-44 average may be attributed mainly to a change from below-average precipitation in the earlier period to above-normal precipitation during the later period, although improvements in wheat breeding and changes in farming methods had some influence. Most of the 4-bushel increase from the 1919-23 period to 1941-44 probably is attributable to such factors as improved varieties and better farming methods and relatively little to weather.

7. Continuing research and experimentation both in wheat breeding and farming methods can be expected to decrease farming hazards and to improve wheat yields still further in future years.

FARM SIZE AND MECHANIZATION CHANGES

Wheat farms in the specialized wheat areas have undergone major changes during the last 35 years. Before World War I these farms were considerably smaller than they are now. In early years, power for farming was derived almost entirely from the use of horses, but today tractors are used almost exclusively in the wheat areas. Advances in machine technology have been extremely rapid and machines adapted to the tractor have almost completely displaced horse-drawn equipment.

Average size of farm has increased in all the major specialized wheat areas since 1910 (table 4). The increase in size of wheat farms is the major factor in increasing the average size of all farms in these areas. Mechanization of wheat farming has been the dominant factor in enabling wheat farms to increase in size.

Table 4.- Average size of all farms in selected groups of counties in specialized wheat areas, 1910, 1920, and 1940 1/

Area	Acreage per farm		
	1910	1920	1940
	Acres	Acres	Acres
Spring wheat 2/	371	437	500
Hard winter wheat 3/	453	509	529
Pacific Northwest (Western) 4/	682	727	1,134
Pacific Northwest (Eastern) 5/	379	399	482

1/ U. S. Bureau of the Census.
2/ Divide, Burke, Bottineau, McHenry, Rolette, Sheridan, Ward, Wells, Pierce, Towner, Kidder, Benson, Renville, and Mountrail Counties, N. Dak.
3/ Barton, Ford, Gray, Hodgeman, Ellis, Ness, Pawnee, Rawlins, Rush, Russell, Sheridan, Trego, Thomas, Edwards, and Finney Counties, Kans.
4/ Sherman, Gilliam, Morrow and Umatilla Counties, Oregon, and Lincoln and Adams Counties, Wash.
5/ Whitman, Garfield, Columbia and Walla Walla Counties, Wash., and Latah County, Idaho.

Wheat farming has been almost completely mechanized since World War I in the spring wheat, hard winter, and Pacific Northwest States. The tractor and the combine revolutionized wheat farming, making possible phenomenal reductions in the amount of labor required per acre of wheat (table 5).

Table 5.- Labor used in producing wheat and percentage of farms using combines and tractors, for selected areas, 1909 and 1936 1/

Areas 2/	Hours of labor per acre		Percentage of farms using combines		Percentage of farms using tractors 3/	
	1909	1936	1909	1936	1909	1936
	Hours	Hours	Percent	Percent	Percent	Percent
Western hard winter wheat	6.1	2.2	0	90	0	94
Eastern hard winter wheat	8.1	3.6	0	80	0	75
Western hard spring wheat	---	4.6	---	71	---	97
Eastern hard spring wheat	6.4	4.9	0	6	0	81
Pacific Northwest	7.2	3.4	24	95	0	74

1/ See footnote 1, table 3, p. 13.
2/ Sample studies were made in each of the areas. The western hard winter wheat area includes western Kansas and Nebraska, Texas and Oklahoma Panhandles, Colorado and New Mexico; the eastern hard winter wheat area includes eastern Kansas and Nebraska, and central Oklahoma; the western hard spring area includes central and western Montana; the eastern hard spring area includes western Minnesota, North Dakota, northern South Dakota and northeastern Montana; the Pacific Northwest area includes parts of Idaho, Washington, and Oregon.
3/ For any practice except threshing.

Primarily as a result of changes since 1910 in size of farm and of mechanization, wheat farms today produce more wheat per farm; have a greater investment in land and buildings; have less investment in work stock and more in machinery. They also return more to farm operators for their labor, management, and investment than did farms in the period before World War I.

This may be illustrated by comparing characteristics of typical commercial family-operated farms in the hard winter wheat area in the two periods 1910-14 and 1938-42. The changes that have occurred on wheat farms between the two periods in this area represent the general trend of change in all the major specialized wheat areas. The average size of typical family-operated wheat farms in the hard winter wheat area in the period 1910-14 was 330 acres with 180 acres planted to wheat. The average size of typical wheat farms in the same area in the period 1938-42 was 620 acres with 350 acres planted to wheat. This represents an increase of about 88 percent in size and 94 percent in acreage planted to wheat over the 1910-14 period. Production of wheat per farm doubled between the two periods; it averaged 1,836 bushels during 1910-14 and 3,687 bushels during 1938-42. Some of this increase was due to increase in size of farm and acres planted to wheat, and some to increased production

per acre planted.

None of the typical wheat farms had tractors in the early period but 99 percent of them had tractors in the years 1938-42, with the result that labor requirements per acre of wheat were reduced from 6 hours to 2.2 hours. The investment in work stock decreased from $805 per farm to $108 per farm. Investment in machinery per farm more than tripled, increasing from an average of $475 during 1910-14 to $1,680 during 1938-42. With the increase in size of farm, investment in land and buildings per farm increased from $8,877 to $13,097.

Perhaps the most significant change that occurred on typical wheat farms between the periods is the increase in income. Primarily as a result of change in farm size, of mechanization, of reduced labor costs, and of increased wheat production per farm, the average return per farm to the operator and family for labor and management in the period 1938-42 was $2,248 as compared with $847 during the period 1910-14. The return on the operator's own investment increased from $1,221 in the 1910-14 period to $2,857 in the 1938-42 period. 4/

In 1938-42 these typical winter wheat farmers received an average price of 81.5 cents per bushel of wheat. With appropriate adjustments for the changes that took place in costs of production and in the price level between the two periods, these farmers, operating under 1938-42 conditions, could have sold their wheat for approximately 45 cents a bushel and still have received an income commensurate with what they received in the 1910-14 period.

In other words, if these farmers had sold their wheat for 45 cents per bushel during the 1938-42 period the returns to the operators and their families for labor and management would have enabled them to buy the same quantities of goods and services as they could in the 1910-14 period. It should be recognized, however, that these typical wheat farms are larger than the average for all farms in the wheat area and that the degree of adjustment between the two periods is greater for these farms than for most other size farms in the area. There were many farmers in the area producing some wheat that had not adjusted so well to changing conditions and their farms were considerably smaller than the typical wheat farms in the 1938-42 period. These farmers would need considerably more than 45 cents per bushel to return incomes commensurate with what they received in 1910-14.

In most major wheat-producing areas there are large numbers of wheat farms that under most conditions are too small to return adequate incomes to farm operators. Increases in size of farm have not kept pace with mechanization, so that many farms have equipment that is not well

---

4/ Unpublished data on farm adjustments and on income of typical commercial family-operated farms by size and type--Bureau of Agricultural Economics. For procedures used in development of these data see Wylie D. Goodsell, Farm Adjustments and Income on Typical Corn Belt Farms, U.S. Dept. Agri. Cir. 688, 59 pp., illus. 1943.

adapted to the size of farm. Many adjustments involving size of farm, mechanization, and efficiency of organization and operation are still needed on wheat farms in all wheat regions.

WHEAT PRODUCTION

Total wheat production in the United States tends to fluctuate considerably from year to year as a result of the wide variations in yields and the acreage of wheat harvested. Production has averaged about 800 million bushels annually from 1910 through 1944, but more than 1 billion bushels were produced in 1944 and only 526 million bushels in 1934. Seldom has production approximated the same levels for more than 2 consecutive years, and annual variations of more than 100 million bushels are not uncommon.

Total United States wheat production shows a slight upward longtime trend (fig. 10). Production during the years before World War I, 1910-14, averaged about 725 million bushels. This was a period in which yields were fairly stable and acreage was increasing. During the period 1915-19, the years most influenced by World War I, production averaged about 825 million bushels. The increase was primarily due to the high yields in 1915 and 1918 to the large harvested acreage in 1919. Production decreased gradually until 1925--influenced primarily by decreasing acreage--then increased again until 1931, primarily because of acreage increases. Production averaged about 840 million bushels during the 12-year period 1919-31. The low period in United States wheat production occurred during the middle 1930's and was caused by the prolonged drought. From 1932 to 1937 production averaged only 660 million bushels as contrasted with 900 million bushels for the period 1938-44.

In World Wars I and II

Total wheat production during the years of World War II has been much greater than production during World War I. During the 3-year period 1942-44, influenced by the war food program, wheat production averaged 965 million bushels from an average harvested acreage of 53 million acres. During the years of World War I, 1915-19, production averaged 824 million bushels from an average harvested acreage of 59 million acres.

Conditions during the two periods were quite different as to both weather and the type of war food program. Primarily under the influence of favorable weather and improvements in yield made since World War I the yields have been very high since 1942, which has resulted in the large production from the smaller acreage. Because large stocks of wheat were on hand, little encouragement was given to wheat production under the war food program of World War II until the production year 1944. In fact, the acreage-adjustment programs were in effect for wheat until February 1943. During World War I, however, the expansion of wheat production was a major item in the war food program. July 1 carry-over stocks in the 4-year period

1915-18, averaged only 103 million bushels, and on July 1, 1918 were only 40 million bushels. In contrast, wheat carry-over averaged 488 million bushels in the 4-year period 1941-44. In addition, wheat from the United States was a far more important part of world wheat trade before World War I than it was before World War II. The need for expansion of wheat acreage was therefore far greater in the first war than in the second. This resulted in the all-time high harvested acreage in 1919.

Production Changes by Wheat Regions

Production has been increasing in the hard winter wheat region and the Pacific Northwest, and has been decreasing in the soft red winter wheat region (table 6). There is no significant trend in the spring wheat region. An increase in acreage is primarily responsible for the production increase in the hard winter wheat region, whereas an increase in yields is primarily responsible for the increase in the Pacific Northwest. The decrease in production in the soft red winter wheat region has been caused by the downward trend in acreage which has more than offset the upward trend in yields.

Production of wheat has increased rapidly in the South, but that is still a minor wheat-producing region. Both acreage and yields per acre have increased there in recent years.

Fluctuations in Production

One of the major reasons that wheat production in the United States as a whole fluctuates as it does is the extent to which production fluctuates in the Great Plains States. 5/

For the period 1926-32, production in the Plains States was at a high level. It constituted 61 percent of the United States production, and was 59 percent above the level of production of all other States taken as a group (fig. 11). In contrast, during the years 1933-36 production in the Great Plains States was at an extremely low level, was only 43 percent of national production, and was 24 percent below the level of production in all other States. During the war years of 1941-44 production in the Plains reached an all-time high--was almost 90 percent greater than production in other States, and constituted about 65 percent of United States production. These spectacular changes in the level of production in the Plains States largely determine whether the national production is high or low, as production in all other States is relatively stable.

The large variation in yield per acre as a result of extreme fluctuations in precipitation is by far the most important reason why production varies so much more in the Great Plains States than in other major wheat regions.

5/ Included are Montana, North Dakota, South Dakota, Nebraska, Wyoming, Colorado, Kansas, Oklahoma, Texas, and New Mexico.

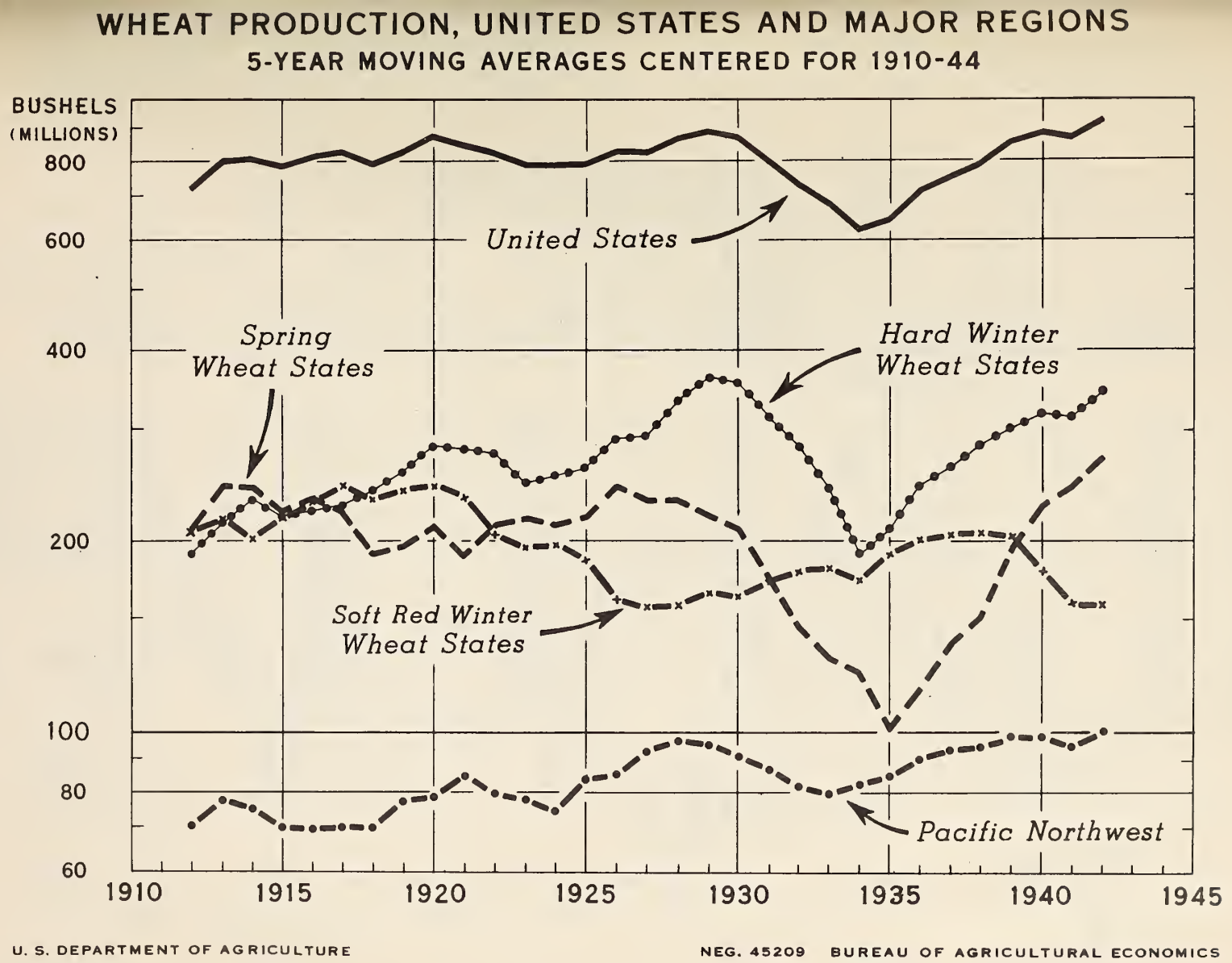


Figure 10.- The decline in United States wheat production in the early 1930's resulted from the effects of the severe drought in the hard winter and spring wheat States. Production in the Pacific Northwest shows a long-time upward trend and fluctuates less than production in the other major regions.

Within the boundaries of the Great Plains States are large areas that must be classed as marginal for wheat production because of recurrent periods of drought. They are commonly referred to as "high-risk" areas. For the most part, wheat is the only adapted crop there. Particularly in these areas prolonged droughts, such as occurred during the 1930's, cause severe repercussions on the economy of the area. For several years during the 1930's harvested-acre yields averaged as low as 7 bushels per acre. In drought years there is large abandonment of acreage. Governmental assistance to farmers has been necessary during the worst period, because opportunities for alternative crops are almost nonexistent and shifting land to grass for livestock production, about the only alternative, is often too great an adjustment for individuals to make without assistance. On the other hand, during periods of favorable rainfall, the areas produce abundantly.

Outside the Great Plains there are other high-risk areas for wheat that contribute to instability of production, but they are relatively small, and have not been subject to the extremes in precipitation that have occurred in much of the Plains States.

The areas of unstable, fluctuating production have special adjustment problems and contribute materially to the fluctuating level of national wheat production. This unstable production is one reason for maintaining a rather large national carry-over, which provides an assured and stable wheat supply for the occasional periods when production is less than domestic requirements.

WHEAT UTILIZATION

Contrasted with the variability of production of wheat from year to year, consumption is relatively stable. In most years domestic disappearance varies less than 40 million bushels above or below the average. Most of this variation is in the quantity of wheat fed to livestock rather than in the quantity milled for human consumption.

There has been a gradual increase in the quantity of wheat used domestically, from an average of about 575 million bushels in the 5-year period 1910-14 to 685 million bushels in the prewar years 1935-39 (fig. 12). This 19-percent increase in domestic use over the 25-year period was less than the increase in population. Per capita consumption of wheat declined during the period.

Net exports of wheat from 1912 to 1928 fluctuated around the 200-million-bushel level, and were sufficient to clear the market of current supplies. Stocks at the end of the crop year seldom exceeded 140 million bushels during this time. Beginning about 1927 there was a steady decline in exports until 1934 when, because of crop failures, exports were exceeded by imports. With the decline in exports and a continuation of previous levels of production, stocks began to pyramid until they reached the previously unheard-of

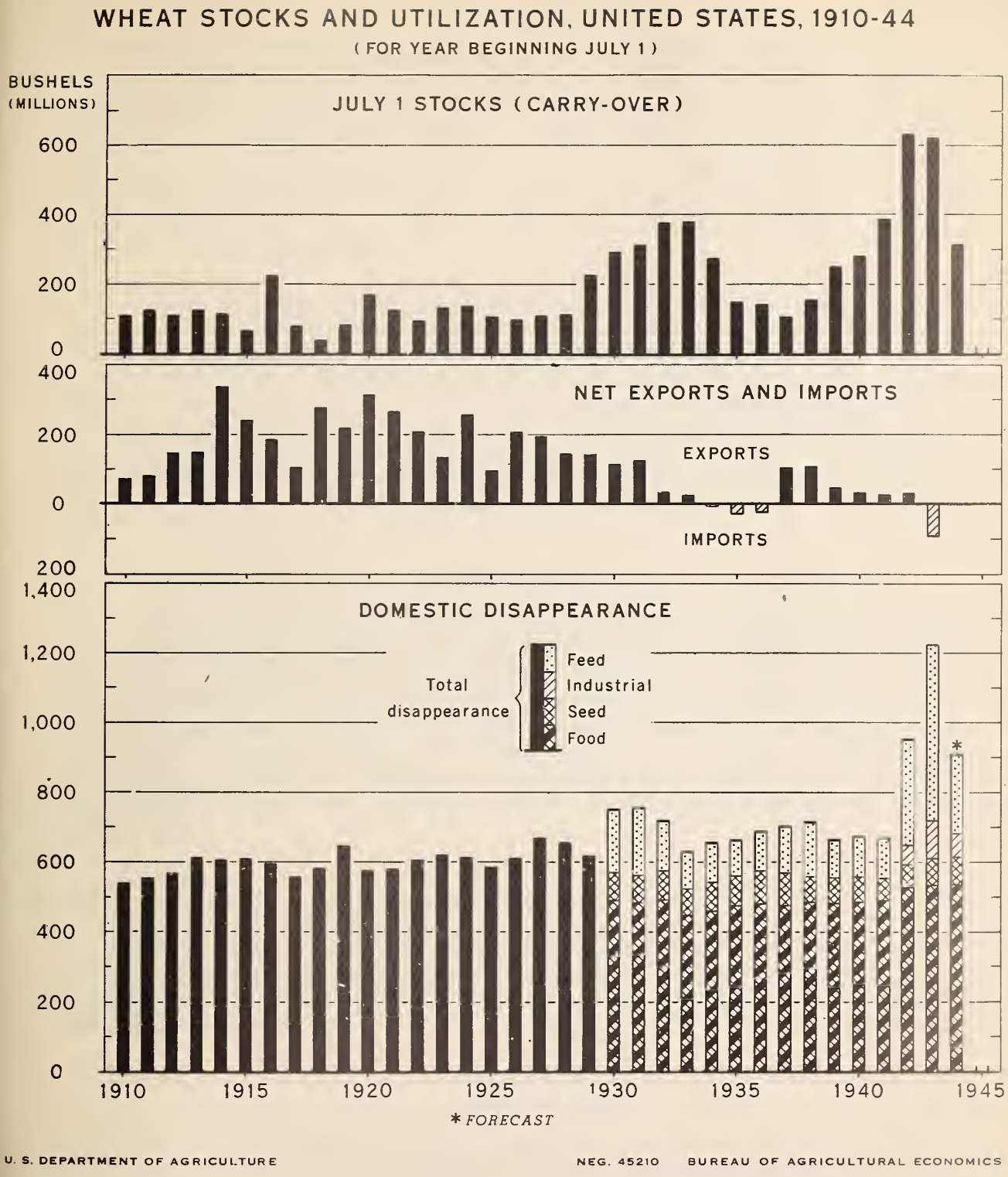


Figure 12.- Wheat stocks were extremely high in 1942 and 1943, but were reduced as a result of the heavy feeding of wheat to livestock through the wartime feed-wheat program. Heavy wheat feeding and industrial utilization are wartime phenomena. Wheat exports have been low since 1931 compared with earlier years (data are not available for a comparable break-down of domestic disappearance before 1930).

level of about 375 million bushels in 1932 and 1933. The drought of the middle 1930's reduced production to less than domestic needs, so net imports were necessary in 1934, 1935, and 1936 to maintain satisfactory working stocks. Increased production after the droughts soon increased carry-overs to high levels, however. With no export outlets except on a subsidized basis, stocks reached a new high of more than 600 million bushels in 1942 and 1943. The carry-over on July 1, 1944 was reduced to about 300 million bushels as a result of the heavy use of wheat for livestock feed and for alcohol manufacture.

This brief review of the disposition of wheat highlights several points that are significant in regard to the future for wheat (1) Wheat stocks in earlier years were maintained at manageable levels as long as exports were high. (2) Stocks have accumulated rapidly with normal production accompanied by low exports. (3) Surplus stocks were reduced as a result of two catastrophes--the drought of the middle 1930's and World War II. (4) Domestic consumption will increase only gradually with an increase in population unless use of wheat for livestock feed or industrial purposes can be expanded beyond previous normal peacetime usage.

POSTWAR PROSPECTS

The position of wheat growers in the world of tomorrow will depend upon many things, but chiefly upon the volume of market outlets for wheat, and upon whether we again will have more wheat than we can dispose of by the usual market procedures at prices satisfactory to wheat growers. At times in the past, burdensome surpluses have accumulated and measures have been taken to reduce production and to dispose of surpluses. Wheat growers have been protected by Government payments and by price supports above the world-market level. Will these or other measures be necessary in the postwar period?

Postwar Outlets for Wheat

What kind of a postwar market can wheat farmers anticipate? The answer necessarily involves some speculation regarding the future; the question cannot be answered categorically. But there are some guideposts that help point the way.

Wheat for Food

The major market for wheat produced in the United States has been and will continue to be the domestic use of wheat for human food. Although per capita consumption of wheat declined considerably during the several decades before 1930, it leveled off about that time and remained very close to 3.7 bushels per capita during the 1930's. During the war years it has

increased to more than 3.9 bushels. Fortification of bread with vitamins and essential minerals may encourage more consumption of bread than formerly, particularly if this practice is combined with improvements in quality of baker's bread. However, shortening the work week and having more leisure time after the war may mean a reduced consumption of high-energy foods. A return to prewar rates of per capita consumption appears to be probable, but there is no reason to anticipate that consumption will drop below that level if standards of quality are maintained or increased.

Estimates of population prepared by Thompson and Whelpton indicate a probable range in the population of the United States by 1955 from 146 million with medium mortality rates, medium fertility rates, and no immigration, to 150 million with medium mortality, higher fertility, and no immigration.6/ The lower figure appears to be the more probable. With these population estimates and a range in per capita wheat consumption from 3.7 to 3.8 bushels, a demand for wheat for human food by 1955 ranging from 540 million to 570 million bushels may be anticipated (table 7).

Table 7.- Prospective utilization of wheat under different assumptions, United States, postwar (1955)

Type of utilization	Probable minimum	Probable maximum
	Million bushels	Million bushels
Food	1/ 540	2/ 570
Seed 3/	75	75
Livestock feed	4/ 110	5/ 200
Exports 6/	60	80
Total utilization	785	925

1/ With an estimated population of 146 million and consumption per capita of 3.7 bushels (average 1932-41).
2/ With an estimated population of 150 million and per capita consumption of 3.8 bushels--very slight increase over prewar per capita consumption, but less than wartime per capita consumption.
3/ For a seeded acreage of 62.5 million acres.
4/ Approximate average of the estimated quantities of wheat fed in the 5 lowest years of the 1930's.
5/ Rough estimate of quantities that reasonably could be expected to be fed if incomes and livestock prices are high in postwar years. This figure was approached in some years in the 1930's, while in the war year 1943 over 500 million bushels were fed.
6/ Assuming the adoption of the Draft Convention of the International Wheat Agreement and its execution as planned.

6/ Thompson, Warren S., and Whelpton, P. K., Estimates of Future Population of the United States, 1940-2000, National Resources Planning Board, 137 pp. Washington, D. C., 1943 (See p. 29).

Use of wheat for seed fluctuates with the acreage planted. An average of 62.5 million acres has been assumed for this analysis, requiring 75 million bushels for seed.

Wheat for Feed

Wheat is normally considered a food grain but large quantities, particularly of wheat of the lower quality, annually are fed to livestock. Much of this is fed on farms where grown, but large quantities are used on other farms, especially on poultry and dairy farms of the far West and in the Northeastern States. An average of about 110 million bushels was used during the 5 years of lowest consumption of wheat by livestock in the 1930's. This should serve as a useful guide to the probable minimum use of wheat for feed in the postwar years.

Wheat is an excellent livestock feed, and from a physical standpoint this use could be expanded up to the available potential for producing wheat. In the feeding year beginning July 1, 1943, under a wheat-feed subsidy program and with high levels of livestock production, an all-time high of 503 million bushels of wheat was used for feed. This high usage was possible from the supply standpoint only because of previously accumulated surpluses and some current imports. Continuation of wheat feeding at anywhere near such a level is practically impossible, but there are possibilities for more feeding of wheat than occurred before this war, provided it is sold at a price that allows it to compete with other feeds.

The value of wheat as a feed has been demonstrated during the war to many farmers who previously had never used it. This should make for a wider market outlet for feed wheat than existed formerly, if price relationships with other feed grains are in approximate balance on a feed-unit basis. The level of wheat feeding in the postwar period will vary, depending upon price relationships between wheat and other grains available for feed, the level of livestock prices, and whether there is a surplus of wheat for feed use. If we have a high national income accompanied by favorable prices for livestock, it should not be difficult to dispose of 200 million bushels of wheat as feed. Measures could be taken, such as the two-price plan used during the war years, to provide for an even larger quantity to be used for livestock feed if that should be desirable.

In deficit feed-grain producing areas prices for grain tend to be above the prices in the major corn-producing States of the Midwest, consequently wheat is in a better competitive position where it is produced nearby. Although barley outyields wheat in many areas on a pound-for-pound basis, wheat is the higher producing feed crop in some cases because it contains from 10 to 15 percent more feed units per unit of weight than does barley. In a few areas wheat yields more pounds of grain than other crops do, and because of its higher feeding value the advantage is even more striking. For example, "Spokane and Whitman County (Wash.) yields indicate that wheat produces from 18 to 25 percent more (pounds of) feed per acre than

barley and 72 to 79 percent more than oats in the northern and central portions of the Palouse Area". 7/ Similar situations are found in a few areas of the Great Plains States, although usually to a less marked degree.

In many areas, however, feed grains other than wheat definitely outyield wheat even on a feeding unit basis and are the preferred crops for producing livestock feed. But increased livestock production in some wheat areas in the postwar years, based upon increased use of wheat as feed, has considerable possibilities where wheat can be produced at feed-grain prices. Production costs of the various small grains are generally similar on an acreage basis.

Exports

Before 1930, exports of wheat were the safety valve--they disposed of the surpluses of wheat. With the low world prices for wheat which prevailed during the 1930's, and a United States price policy that resulted in maintaining domestic wheat prices above world levels, exports were impossible except on a subsidized basis. Just what the world-trade situation will be after this war is uncertain.

Some progress has been made in charting a course for world trade in wheat in the development of a wheat agreement among the four major exporting Nations (the United States, Canada, Australia, and Argentina) and the United Kingdom, the major wheat-importing Nation. A Draft Convention has been prepared which, if approved and placed into operation, would provide for an orderly division among the four major exporting countries of the world wheat trade available to them. Under this arrangement the export quota for the United States would be about 16 percent of the total wheat expected to be exported from the four major exporting Nations. 8/ Estimates have been made that this would provide for United States exports of from 64 to 80 million bushels in the postwar years. These estimates are not certainties, but they provide the best clue at present as to the probable postwar volume of exports. Net exports in the 1935-39 prewar period averaged 42 million bushels per year.

The minimum and maximum estimates of prospective utilization of wheat for the United States, summarized in table 5, suggests a range from 785 million bushels to 925 million bushels, with actual utilization in any one year likely to be somewhere between these two extremes. The two most variable items are livestock feed and exports, partly because they are more responsive to price changes and partly because disposal of any accumulated surpluses almost necessarily will be made through these channels.

7/ United States Bureau of Agricultural Economics. Producing Wheat for Feed in the Western States. Bur. Agr. Econ., 7 pp. 1942. Processed for administrative use only. (See p. 2.)

8/ United States Office of Foreign Agricultural Relations. The International Wheat Agreement. 32 pp. Washington, D. C. 1942.

Wheat Supply Prospects

The wheat-production potential is larger than ever before because of the improvements that have been made in yields per acre. In addition, it seems probable that a larger acreage than formerly would now be seeded by farmers under the same price conditions because production costs per acre and per bushel have been reduced as a result of improvements in yield and mechanization.

Since 1919, wheat yields in the United States per planted acre have averaged about 12.5 bushels per acre. Under normal weather conditions yields in the postwar period (about 1955) should average about 14.4 bushels per acre, based upon estimates of improvements of yield by wheat regions (table 8). These estimates of yield are based on analysis of trends in yield presented in preceding pages.

Table 8.- Wheat yields per acre planted, 1919-44 average and estimates of postwar (1955) yields under normal weather conditions, United States and by groups of States.

Groups of States	Average 1919-44 yield	Estimated normal postwar yield
	Bushels	Bushels
United States	12.5	14.4
Spring wheat States	10.5	12.5
Hard winter wheat States	11.0	13.0
Soft red winter wheat States	15.6	17.5
Pacific Northwest	19.7	22.5
Pacific Southwest	16.9	19.4
South	10.0	13.0
Northeast	18.6	21.0

If the postwar wheat acreage should approximate the long-time average seeded acreage of 66 million acres (1919-44 average) total production would be about 950 million bushels, or about 3 percent above the estimate of probable maximum demand of 925 million bushels (table 9). However, if the

postwar demand for wheat approximates the estimate of minimum demand, or 785 million bushels, a seeded acreage of only 54 million acres would be necessary. This is slightly above the low point of the 52 million acres reached in 1942 under the AAA program. On the other hand, production could easily be above 1 billion bushels under normal weather conditions, if as much as 81 million acres were seeded--the all-time high reached in 1937.

Table 9.- Wheat production that would result from planted acreage at different levels with estimated normal postwar yields of 14.4 bushels per acre

Situation	Acreage	Production from indicated acreage
	Million acres	Million bushels
Lowest acreage since 1919	52	749
Highest acreage since 1919	81	1,166
1919-44 average acreage	66	950
Required to meet probable minimum demand	54.5	1/ 785
Required to meet probable maximum demand	64	2/ 922
Postwar adjustment study	3/ 63	907

1/ Estimate of minimum demand (table 7).
2/ Estimate of maximum demand (table 7).
3/ Postwar acreage as estimated by State Production Adjustment Committees; assuming relatively favorable wheat prices and desirable land use and conservation of resources.

A postwar seeded wheat acreage of about 63 million acres has been suggested by State Production Adjustment Committees, assuming desirable land use, maintenance of soil resources, and relatively favorable prices. This would mean a total production with anticipated average yields at slightly below the production needed to meet estimated maximum demand.

The quantity of wheat produced does not respond readily to changes in demand. National production has not declined during past "wheat depression" periods, when surpluses were large and prices were low. The lack of alternatives in the major commercial wheat-producing regions--the Great Plains and Pacific Northwest--is the principal reason for this lack

of response. The adjustments that would be necessary to "go out of wheat" in the specialized areas would bring large losses to the individual farmers affected unless special programs were provided to cushion the shock of adjustment. Farmers in these areas are likely to grow as much wheat as possible in periods of low prices in order to bolster their shrinking incomes.

For this reason, a fairly large wheat acreage will be maintained in the Great Plains and Pacific Northwest specialized areas in the postwar period almost regardless of economic conditions, unless measures are taken to reduce the acreage. If surpluses accumulate in the postwar period and prices drop to a low level, as in the early 1930's, many of the farmers would need outside financial assistance. Shifts to other farm enterprises would require major changes in the entire farming economy of these areas.

In the more humid areas, particularly the soft red winter wheat region, seeded acreage either increases or decreases rapidly depending upon the profitableness of wheat production relative to other crops. If the prices should drop because of surpluses in the postwar period, and if wheat production becomes unprofitable, the seeded wheat acreage in this region can be expected to go down, although a minimum acreage will be grown as a rotation crop. If wheat production is profitable, relative to other alternatives, the acreage is likely to increase in the humid areas.

Implications

If utilization of wheat in the postwar period approximates 925 million bushels (the estimate of probable maximum) there probably would be little difficulty with surpluses of wheat. This quantity could be produced on approximately 64 million seeded acres--only 2 million acres below the long-time average. Under this demand situation, a fairly large wheat acreage would be maintained in most of the hard winter, spring, and Pacific Northwest wheat regions. Acreage in the soft red winter and other humid areas would tend to fluctuate more with price changes.

The postwar utilization of wheat more nearly approaches the estimated minimum of 785 million bushels, burdensome surpluses would be likely to accumulate. As production became less profitable under these conditions, the seeded acreage might decline in the soft red winter wheat region, but it would tend to be maintained in the other major regions because of lack of alternative lines of production. It is extremely unlikely that the seeded acreage in the United States would drop below 60 million acres without an acreage-control program, unless prices were depressed to very low levels for a number of years. Wheat acreage has been below 60 million only once since 1920 (until the time of the adjustment program of the 1930's); this was in 1924, before completion of acreage expansion in the Great Plains, and before the full effects of mechanization had been realized. But even with a probable low of 60 million planted acres, production would approximate 865 million bushels with average expected yields. This production would mean an average annual surplus of about 80 million bushels under conditions of

probable minimum utilization. Acreage could easily be closer to 66 million (the 1919-44 average and approximately the 1944 acreage), in which case an average annual surplus of about 165 million bushels would result under low conditions of demand.

Unless some direction is given to the course of future production and utilization of wheat, some painful experiences in adjustment lie ahead for the wheat farmers. Conceivably, national policy could be oriented to provide either for (1) greater utilization of wheat (for livestock feed and for export) and therefore a fairly large wheat acreage, or for (2) less production to meet a relatively small utilization which would mean a smaller acreage of wheat.

ALTERNATIVE WHEAT POLICIES

Production and price policy for wheat in the postwar period can be oriented in one of several directions, but the results to be expected from adoption of each or a combination of alternatives may be decidedly different. A clear understanding is needed of alternative policies, and of the consequences that would follow their adoption. Only when that is obtained can a start be made toward an intelligent selection of the most appropriate policy for the conditions that will prevail in the postwar period.

The concept of parity returns for farmers has been widely discussed and fairly well accepted as a part of agricultural policy. But parity returns can be achieved in several ways. Supporting the price for a specific commodity at parity levels is frequently suggested as a means of achieving parity returns. Maintenance of parity prices for wheat in the postwar period on the present basis of calculating parity would undoubtedly result in a high acreage of wheat, unless restrictions in acreage were imposed.

Costs of production in terms of physical inputs have been reduced sharply since the 1910-14 base period. Wheat has been more completely mechanized than any other major crop. Hours of human labor required per acre for producing wheat are today less than half what they were in the period just before World War I in the specialized wheat-producing areas. Horses have been almost completely replaced by tractors as the source of power in those areas. Farming methods have improved, yields have increased, and the size of the average operating unit is larger. Consequently, with the same price relationships as in former years, farmers will produce more wheat.

Parity prices for wheat with no production control probably would result in an acreage at least approaching, if not greater than, the peak of 81 million acres planted in 1937. Such an acreage would mean expansion into marginal areas where yields are low, and there would be a tendency for less summer fallow and less use of conservation practices. A somewhat lower average yield for the United States would come from such a large

acreage. But even should yields be 1 bushel per acre less than would be expected on a smaller acreage with normal weather conditions, production would approximate 1.1 billion bushels. A production like that would exceed the probable postwar maximum utilization by 175 million bushels and the probable minimum utilization by 315 million bushels.

Obviously, surpluses would mount rapidly and soon would be unmanageable. A policy of full parity prices with no controls on quantity produced is thus unstable and could be continued for only a very few years at most. Thus such a course can be eliminated as a practical wheat policy. What then are the alternatives?

Three major alternatives of price and production policy are discussed in the following pages. Then comes a concluding section which considers the basis for and the major elements of a conversion program that might be given consideration as a long-range policy for wheat in a freely functioning economy.

Parity price with production control and marketing quotas

Because of the relatively inelastic demand for wheat for human food, the price of wheat is not a major influence in the quantity used for food in the United States. A large percentage rise in the farm price of wheat usually brings only a small increase in the retail price of bread. Farm parity prices for wheat might therefore result in rather small reductions in the quantity used for domestic food. But domestic food uses are only part of the market outlet.

At parity or near-parity prices only wheat of the lowest quality would be fed to livestock, and most of this would be fed on farms where produced. Experience of the past suggests that not more than 100 million bushels of wheat for livestock feed would be used under these conditions. Even the minimum exports of 60 million bushels suggested in earlier pages would be possible only with an export subsidy. Without such a subsidy, wheat exports probably would nearly disappear.

Total utilization would be no more than 785 million bushels, and without an export subsidy would more nearly approach 700 million bushels. This production can be obtained on 48 to 52 million acres, and this acreage could not be exceeded over a period of years without accumulation of surpluses. A rigid control program with marketing quotas would be necessary. This is the general type of program that was in effect on wheat just before World War II, although prices were not supported at full parity levels.

Limitation of wheat acreage to 48-52 million acres would result in under utilization of resources in the wheat areas. On the assumption that about 63 million acres of wheat, as estimated by State Production Adjustment Committees, would provide for most effective utilization of resources and

maintain soil productivity, a certain degree of under utilization would occur on 10 million or more acres of land. The extent of under utilization would depend partly upon the features of the program adopted. If an acreage-control program were adopted that involved the same percentage reduction in all parts of the country, the degree of under utilization of resources would be greater than with a differential adjustment, that is, heavier adjustments made in areas where alternative production opportunities are available and smaller reductions made in areas where alternatives are limited. Nonuse of land or definite under utilization in the drier parts of the wheat-producing areas, particularly in the western parts of the Great Plains, might total as much as 5 or 6 million acres. If substitution of feed crops were not permitted on the acreage taken out of wheat, under utilization would extend throughout the wheat-producing areas. Even without such a provision, under utilization would exist in many areas where wheat is the only well-adapted crop. Under an acreage adjustment program of this magnitude a material expansion in the acreage of summer fallow would be expected, with resulting higher average yields on the acreage harvested, and with somewhat greater stability of yields.

Such an acreage-control program, besides involving restrictions on production of wheat growers, would involve a substantial cost to the Federal Government for administrative expenses, and also would mean higher prices to consumers of wheat products than would be expected if wheat acreage were stabilized at prices that would clear the market for all uses. Prices of wheat to growers could be maintained at relatively high levels but this would be offset in part by higher unit costs of production because of a smaller volume of wheat per farm on a restricted acreage. Reduced wheat production also would result in less employment and a smaller volume of business in food processing, distributing, and transportation industries.

Two-price system

Another alternative is to maintain parity or near-parity prices of wheat for food uses, and permit a free market price of wheat for feed and for export. Such a program would attempt to maximize returns to wheat growers, and at the same time obtain approximately full utilization of resources by taking advantage of the opportunity to differentiate the product (and the price) according to the available outlets. Maintenance of relatively high prices of wheat for food uses is possible because of the relative inelasticity of demand as discussed above.

The average price received by farmers would be less than parity even though parity prices were maintained for the portion of production going into food uses. The amount by which average prices were below parity would depend upon the proportion of total production that would go into commercial feed and export outlets, and upon the level of world prices for wheat and for feed grains. An illustration of the differences that might prevail in prices of wheat for food, feed, and export uses, and in the average price is given in table 10.

Table 10.- Simplified illustration of operation of a two-price system for wheat 1/

Type of utilization	Quantity utilized	Price per bushel	Gross value
	Million bushels	Dollars	Million dollars
For milling	540	2/ 1.20	648
For feed (commercial)	100	.75	75
For export 3/	75	.80	60
Total sales	715	4/ 1.10	783
For seed and feed on wheat farms	160	--	
Total utilization	875		

1/ Prices and quantities assumed are for illustrative purposes only.
2/ Assumed parity price.
3/ Price differential between feed and export wheat attributable to differences in quality of wheat.
4/ Average or blended price for all wheat.

Several methods could be used for administering such a two-price plan, but all would involve rather complex administrative machinery, and thus would require substantial administrative expenses. The multiple-price plan is not uncommon in other commodities, both in agriculture and industry. Marketing of fluid milk is an example, although the plan is administered largely by the industry itself and to a minor degree by the Government. Because of the nature of wheat, its widespread market, and free intership-ment between markets, a two-price plan almost necessarily would need to be Nation-wide and Government-administered.

One method would be to develop a system of purchase of certificates by millers for each barrel of flour sold, or on purchase of cash wheat for milling. The value of these certificates would be adjusted to bring the cost of wheat to millers up to a level that would make it possible to reflect parity prices to farmers for the wheat sold for domestic food uses. The value of the wheat certificates would be changed from season to season as the market price shifted up or down. The money received from certificates could be turned into the United States Treasury, and offsetting appropriations could then be made for payments to farmers.

Another device would be to have all millers buy wheat from an agency such as the Commodity Credit Corporation which would sell the wheat to millers at parity prices.

The method of payment selected for returning proceeds from food-wheat sales to growers would have some effect on the quantity of wheat produced. One method might be to make a per bushel payment for all wheat sold, the rate to be determined by dividing the total proceeds from certificate purchases by the estimated quantity of all wheat sold. This would give a blended price to all producers somewhat above the market price. For example, if purchase certificates were sold to millers at 40 cents per bushel and wheat used for milling that year was one-half of total production, then a payment of 20 cents per bushel would be returned to producers for all wheat sold. Acreage response would then be determined by the blended price.

Another method would be to allocate the full payment collected per bushel to a certain percentage of the crop sold, either fluctuating from year to year or related to some base production. In the latter case a farmer might be given a definite parity production base of so many bushels, in accordance with production possibilities on his farm, and proportionate to the quantity that was sold for food purposes throughout the United States. In this case any wheat produced above the production base would receive only the market price, and it would not be profitable to seed additional acreage unless production costs were below the free market price. But the farmer would be free to seed as large an acreage of wheat as he wished. The two-price system would then be fully operative at the farm level.

Acreage planted under such production provisions, but with no restrictions on total acreage, probably would be considerably less than under a system of payment that would reflect a blended price to the producers. Production above the base would tend to be considered by the farmer as competitive in a free market with world wheat supplies or with other feed grains. If wheat could not be produced profitably at world-market prices or at feed prices the rest of the land would revert to some other use or would be planted to other feed crops if these were more profitable. The shift from wheat would thus be much greater in the more humid parts of the Great Plains and the Pacific Northwest and in the soft red winter wheat region than it would be in the drier sections where no practical alternatives to wheat production are available.

One other feature of the production base system would involve an element of insurance. If the base were in terms of bushels of wheat rather than acreage, the farmer would be assured a market at approximate parity prices for a rather definite volume of wheat that would vary but little from year to year. Assuming that with normal yields he usually produced considerably above the base, in years of low yields he would receive approximately parity price for a higher percentage, if not for all of his crop. For example, a farmer with a 2,000 bushel base who normally produced 3,000 bushels, but because of low yields produced only 2,000 bushels in one year, would receive parity prices for the entire production. Under the system of a blended-price payment he would receive a lower price per bushel, the differential between the two systems depending upon how widespread the

low yields were that particular year. If total United States production were only enough to supply domestic milling requirements the returns would be the same under either system.

Just as with the alternative of parity prices with production control, the two-price system would involve substantial administrative expense and increased price to consumers of wheat products. There would be only indirect restrictions on acreage, however, and therefore little effect upon the volume of wheat handled by wheat processing, distribution, and transportation industries.

Free Market Price with no Controls

Another alternative is to pursue a policy aimed at elimination of all controls over production and permit prices to stabilize at levels that clear the market for all uses. This alternative is based on the proposition that the best and most effective way to obtain an adjustment of the use of production resources to effective demand for each product is through the free interplay of prices in the open market. If supply or production exceeds demand the price will fall relative to other products until sufficient resources are shifted to the production of other commodities to bring the net incomes from each into approximate balance.

Free market prices would assure that consumers would be supplied wheat products at competitively determined levels; and wheat processing, distributing, and transportation industries would have the volume of business and employment that would result from unrestricted production.

Given a sufficiently long period of time, with gradual declines in wheat prices, and relatively prosperous general economic conditions, so that alternative opportunities are available either on the farm or in industry, the repercussions of such a policy in the wheat areas might not be too severe. If the transition from supported domestic prices to world-market prices were made rapidly, even over a period of 2 or 3 years, severe hardships would develop on many wheat farms. Fixed costs are high on mechanized wheat farms and these can be reduced only over several years. Included are such costs as taxes, which are not subject to rapid adjustment and over which the individual has little control.

The factor of high fixed costs is less important in areas in which there are suitable alternative opportunities for crops or livestock production than it is in areas that can grow only wheat and in which the next best alternative is use of the land for grass. Little, if any, of the wheat machinery and equipment can be used in such an enterprise, and the capital structure of land values is too high to permit the present occupant of the land to make such a shift. Declining prices for wheat in such a situation usually result in an effort to produce more wheat to cover part of the fixed costs so long as prices are above the variable costs. There is more rather than less production--exactly the opposite effect from that which the lowering of prices is supposed to give. Continued low prices over a period of years will

of course bring about a downward adjustment in production through forcing marginal operators out of business, but at a high cost in human distress.

Freely functioning market prices are a desirable national goal but an immediate shift after the war to such a system would mean hardship and suffering to many wheat farmers. If a policy of free market prices for wheat is adopted in the postwar period and this hardship is to be cushioned, the transfer will need to be gradual and will need to extend over a period of years.

A Conversion Program

These are the three major alternatives in production and price policies for wheat. Various combinations of these policies are possible. For instance, if free-market prices were the eventual goal, a two-price plan as described might be used temporarily as a means of making the transition. The differential between the price of food wheat and the price of other wheat could be gradually reduced over several years until prices were determined entirely in the open market for all wheat. Under each of the policies a number of different programs might be adopted that would be helpful to wheat farmers in making desirable adjustments and in stabilizing resources and production, such as soil-conservation programs, crop-insurance programs, and credit programs.

Assuming that national policy is aimed at a freely-functioning market price for wheat in the postwar period, what are some of the elements of a program that might assist in cushioning the transition shock, and what are some of the more important problems that need to be faced? A well-considered conversion program can assist materially in bringing about adjustments and in alleviating the stresses that inevitably would be associated with the adoption of a policy of free market prices. Wheat farming in the United States has been carried on for a number of years with a cost-and-income structure based upon higher than world-market prices. Land values and taxes are higher than can be supported at a lower level of prices with the prevailing size and organization of wheat farms in many areas. Relatively high-cost areas and methods of operation have been maintained that would have to be adjusted to lower cost levels. This means shifting from wheat to other enterprises in some cases, or shifting out of crop farming altogether and into a livestock-grazing economy in others. These are major adjustments and they are not easily or cheaply made.

Wheat farming is now almost completely mechanized in the major specialized producing areas, but older, higher cost methods of operation still persist in some areas, and on some individual farms even in the highly mechanized areas. Even where mechanization is most complete, however, the size of farm and the organization of production has not been changed to take full advantage of producing at lower costs. Many farms are too small and the machinery and other investment items are too high per unit of output to permit of low-cost operations. The price of wheat necessary to keep such units in a solvent position, and to provide an adequate family income, is

far above what is needed to return a good income on larger, more efficiently operated family farms.

Adjustment Opportunities

Lower costs per unit associated with a larger volume of production on family farms will bring higher incomes, both for the area and for the farm family, than will a restricted volume at higher costs and higher prices. This can be illustrated by comparing the cost structure on farms of different sizes and methods of operation in the spring wheat area of northeastern Montana and western North Dakota (table 11).

Table 11.- Illustration of effect of changes in size of farm and in rotation practice on costs of production, owner-operated farms in spring wheat area of northeastern Montana, and northwestern North Dakota

Item	Farm with cropland of --		
	400 acres 1/	600 acres 1/	800 acres 2/
	Dollars	Dollars	Dollars
Investment:			
Real estate:			
Land at $15 per acre	6,000	9,000	12,000
Buildings and fences	3,600	4,000	4,000
Total	9,600	13,000	16,000
Machinery and equip.(at ½ new value):			
Tractor (3-plow rubber-wheel)	700	700	700
Combine	600	750	750
Implements	450	450	450
Miscellaneous	150	200	200
Total	1,900	2,100	2,100
Automobile	450	450	450
Truck	500	500	500
Livestock	125	125	125
Feed, supplies, etc.	500	500	500
Total investment	13,075	16,675	19,675
	Acres	Acres	Acres
Production and utilization:			
Acres of wheat seeded	267	400	400
	Bushels	Bushels	Bushels
Yield of wheat per seeded acre	12.0	12.0	14.0
Wheat produced	3,204	4,800	5,600
Used for feed	50	50	50
Used for seed	267	400	400
For sale	2,887	4,350	5,150

Continued -

Table 11.- Illustration of effect of changes in size of farm and in rotation practice on costs of production, owner-operated farms in spring wheat area of northeastern Montana, and northwestern North Dakota - Continued

Item	Farm with cropland of —		
	400 acres 1/	600 acres 1/	800 acres 2/
	Dollars	Dollars	Dollars
Farm expenses:			
Operating expense:			
Taxes:			
Land and buildings (30 percent of assessed value and 80 mills)	230	312	384
Personal property (20 percent and 80 mills)	56	59	59
Hired labor at $5 per day	100	150	150
Operation, depreciation, and repairs:			
Tractor at 70 cents per hr.	315	448	456
Truck	200	250	300
Auto	125	150	150
Depreciation and repairs:			
Buildings at 3 percent	108	120	120
Fence	40	60	80
Machinery at 10 percent of new value	840	280	280
Livestock feed	40	40	40
Miscellaneous	160	215	215
Total operating expenses	1,614	2,084	2,234
Allowance for:			
Operators' labor and management	1,000	1,000	1,000
Interest on investment at 4 percent	523	667	787
Total allowance	1,523	1,667	1,787
Total farm expense	3,137	3,751	4,021
Cost rates:			
Operating expense:			
Per acre of cropland	4.04	3.47	2.79
Per acre of wheat seeded	6.04	5.21	6.58
Per bushel of wheat sold	0.56	0.48	0.43
Total expense:			
Per bushel of wheat sold	1.09	0.86	0.78
Per acre of wheat seeded	11.75	9.38	10.05

1/ Wheat-wheat-fallow rotation.
2/ Alternative wheat-fallow rotation.

A farm that has 400 cropland acres is representative of a large proportion of farms in that area, although many farms are smaller. Under the cost structure used in the illustration, wheat produced on this 400-acre farm must be sold at $1.09 per bushel to provide the operator a labor-and-management income of $1,000 and 4 percent interest on his investment, after allowance for depreciation and current operating expenses is made.

With the size of machinery and equipment usually found on such a farm it is easily possible to handle a larger acreage. The addition of 200 acres of cropland permits much more complete utilization of the machinery and the operator's time, and this acreage can be readily handled by a farm family. In the illustration a somewhat larger combine than the one in use was considered to be desirable, although the other equipment was adequate. With this larger farm the operator would be able to obtain the same income for labor and management as before with the price of wheat at only $0.86 per bushel or 23 cents less than on the smaller farm. The investment required would be $3,600 greater--represented almost entirely by the cost of additional land.

Experience has demonstrated that the most effective utilization of machinery and operator's time can be obtained in a system of alternate wheat and summer fallow, where this system is well adapted. In addition to greater efficiency, yields of wheat on summer fallow, where adapted, are greater than on wheat following wheat. One-third of the land has been assumed to be in fallow on the 400- and 600-acre farms in the illustration. Many farmers still follow a continuous cropping system, which may mean even less effective utilization of machine and operator's time than in the illustrations used.

A third farm is illustrated which has 800 acres of cropland, but is operated on an alternate wheat-fallow system. Yields have been assumed to increase to 14 bushels per acre from 12 bushels per acre on the wheat-wheat-fallow system. This is considered to be a conservative estimate of the increased yields obtainable from this practice. Tractor hours used on this farm are only slightly greater than on the 600-acre farm, with the same wheat acreage but with 200 acres more of fallow. With such an operation the same income for labor and management can be obtained by the operator with the price of wheat at only 78 cents per bushel, compared with $1.09 on the 400-acre farm, and 86 cents on the 600-acre farm. Wheat sold from the three farms would be 5,150, 2,887, and 4,350 bushels respectively. Comparing the 800-acre farm with the 400-acre farm, wheat sold is 78 percent greater on the larger farm, but 11 percent less per acre of cropland, and the cost per bushel has been reduced by 28 percent.

Although total output of wheat would tend to be reduced as more farms shifted to this type of operation, production costs would be materially less and farm incomes would be much greater at the same price for wheat.

The number of farms obviously would be smaller, but net spendable income of farmers for the area would be greater. This point can be illustrated by using the previous examples of the 400- and 800-acre farms and calculating

the incomes available for the operator's labor and management under the two systems with varying prices for wheat. Two 400-acre farms will produce less total income for labor and management than one 800-acre farm, even with a farm price for wheat of $1.40 per bushel.9/ Two of the small farms will produce a total income of $3,806 available for the operator's labor and management return, or $1,903 per farm; whereas the one 800-acre farm produces $4,189 (table 12).

Table 12.- Income for operator's labor and management with various prices of wheat from 800 acres of cropland 1/

Farm price of wheat per bushel	Income from 800 acres operated as -		
	2-400 acre farms with a wheat-wheat-fallow rotation		1-800 acre farm with an alternate wheat-fallow rotation
	Total	Per family	
Dollars	Dollars	Dollars	Dollars
1.40	3,806	1,903	4,189
1.20	2,651	1,326	3,159
1.10	2,073	1,036	2,644
1.00	1,496	748	2,129
.90	919	460	1,614
.80	341	170	1,099
.70	-236	-118	584
.60	-814	-407	69

1/ Based on data shown in table 9.

As the price of wheat declines, the advantage in favor of the larger farms becomes greater. For instance, with wheat at 80 cents per bushel the larger farm produces an income for labor and management of $1,099, but the two small farms combined produce only $341 or $170 per farm. The competitive advantage of the larger operation is obvious. Its ability to continue

9/ The major reason for this is that two sets of machinery and buildings are required, either set of which, with only minor additions, is adequate to handle the acreage on the larger farm with a change in cropping system.

profitable operation with declining prices is far greater than is found in the smaller operation. In the illustration, with wheat at $1.10 per bushel, the 400-acre farm provides an income for labor and management of $1,036 per family. Approximately this same income is obtained on the 800-acre farm with wheat at 80 cents per bushel. At that price, the labor-and-management income on the 400-acre farm is only $170.

These illustrations explain the persistent tendency toward increased average size of farm in the specialized wheat areas. Although the possibility of lowering unit costs of production through summer fallowing are not possible in all areas, because summer fallow does not give noteworthy increases in yield in many wheat areas of higher rainfall, other factors have encouraged increases in farm size almost universally. Where conditions have been favorable for acquisition of land, the sizes of farms have increased, but this can occur only when land is made available for addition to existing operating units either by retirement of operators or by some families moving out of the area.

During this war period, many families have left the Great Plains to take jobs in war industries. The land they left has been taken over by remaining farmers, and the average size of operating unit in many areas has increased. For instance, in one of the principal wheat-producing areas of South Dakota, the estimated average size of farm in 1940 was 697 acres, whereas in 1943 it was 785 acres, showing an increase of 13 percent during the 4-year period.10/

Whether increases in size of operating units similar to that in wartime will continue in the postwar period depends upon whether those who left sold their places to be combined with other farms or rented them; and whether they return to the area, either voluntarily or because other employment is not available. The most competent opinion is that the wartime changes will tend to be permanent. Much more consolidation of small units must occur, however, before the agriculture in these areas will be on an efficient, family-size operation basis.

The transition to larger, more efficient units can be made gradually if neighboring farmers who wish to remain in the area take over parts or all of the land now operated by other farmers who want to move off their farms. This will take many years, and will be slowed to the extent that new operators or members of the family take over the operations of the retiring farmers. The process can be speeded up by provision of suitable credit facilities, by providing opportunities elsewhere for those who do not wish

---

10/ South Dakota Agricultural Experiment Station. Twenty Years Agricultural Statistics for South Dakota, 1924-43. S. Dak. Agr. Expt. Sta. Econ. Pam. 9, 44 pp. 1943. (Processed). (See table 5, pp. 11-12. Counties included: Campbell, Edmunds, Faulk, Hand, Hughes, Hyde, McPherson, Potter, Sully, and Walworth.)

to continue farming there, and by discouraging the movement of other farmers into the area except when a farm of adequate size can be obtained.

Adjustments in farm size and in reorganization of many units for increased efficiency would be one of the major goals in a conversion program designed to enable farmers to obtain adequate incomes under a free-market-price system. Other elements of such a program should be related to this major objective and be geared to facilitate its attainment.

A comprehensive conversion program for the wheat areas would involve several major elements.

1. Enlarging farms which are now too small to be efficient operating units, with credit facilities and policies adjusted to encourage consolidation of small units.

2. Machinery adapted to the size of farm, and the cropping system adapted to the machinery, to provide more effective utilization of machine and operator's time, and to spread overhead costs over more units of production.

3. Conservation practices adapted to specific areas and individual farms, to conserve soil resources, and to provide long-time stability of farming in the area.

4. Combination of range livestock and wheat production where conditions permit, on relatively larger farms in the high-risk areas, where yields are very low and extremely variable. Payments for conversion of low-yielding wheat land to grasses, and credit for purchase of livestock, for increased livestock and feed production, and for livestock and feed shelter would be an integral part of this process.

5. Production of wheat for use as livestock feed or production of feed crops where they outyield wheat on a feed-unit basis; to provide for more livestock on wheat farms in order to stabilize incomes, increase efficiency of family-labor utilization, and to increase soil fertility.

6. A sound crop-insurance program to provide a minimum income in the inevitable year or years of drought and low yields, particularly in the areas of higher risks. Such a program would require widespread participation by wheat growers, with premiums adjusted to the hazards of individual farms. Perhaps eligibility for participation in benefits of a conversion program should be made conditional upon participation in the crop-insurance program, thus assuring a wide insurance base and strengthening the crop-insurance program itself.

A conversion program as outlined above would need to be facilitated by provision for special types of credit assistance, purchase of land, employment service, and training facilities for assistance in finding other work for those who wish to move out of the wheat areas, and technical assistance to farmers in developing their long-time farming programs. A

period of 5 to 10 years would be necessary to make the transition successfully. During this time a policy would be followed of gradual withdrawal of wheat-price support, so that at the end of 5 or more years the prices for wheat would be on a free market basis.

All farmers should be eligible to participate in conversion and crop-insurance programs. Many farmers could make the transition without any special assistance, but those who wished to convert to some other enterprises, to reorganize or enlarge their operating units, or to move from the area, could be given special assistance. Conversion payments to make desirable changes in farming should be made conditional upon the carrying out of a long-time farm plan.

When consumated, such a program should result in full utilization of resources in specialized wheat areas with no restrictions on production. Most farms, if organized on an efficient family-farm basis, should be able to compete successfully, and should provide adequate incomes even in periods of only moderate prosperity. In periods of depression or extreme drought, assistance might be necessary, but probably no more than would be needed in any other segment of the economy. Fewer farms would be operated in the specialized wheat areas than today, but those farmers who remained in wheat production would stand on their own feet, would not be dependent on governmental assistance to survive as producers of wheat, and would be free to produce whatever they wished.